## History

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1. Introduction
The Car-Communication-Application-Promotion group (CCAP) is concerned that Car-WG profiles may not provide sufficient definition to assure interoperability of Bluetooth devices supporting these profiles. CCAP believes that this application guide for the Bluetooth Hands-Free applications will improve the interoperability between handheld devices and the car, and help implementers understand the Hands-Free profiles for user convenience. This guideline provides:

- Recommended values of parameters
- Recommended sequence charts
- Basic philosophy
- Option usage
- New scenarios not included in the HFP

The intent is that this guideline be applied to the application layer above the Hands-Free Profile (HFP). The CCAP may also provide additional guidelines in the future such as the Phonebook Access Profile (PBAP), the Message Access Profile (MAP) etc. and future versions of these profiles.

CCAP released the Application Guideline Ver1.0 for the Hands-Free Profile Ver1.0 in June 2003. This guideline is based on the Hands-Free Profile Ver1.5. There indicates newly added and changed features from the Hands-Free Profile Ver1.0 and the CCAP Application Guideline Ver1.0.

NOTE: CCAP does not intend to replace or enhance the Hands-Free Profile. CCAP intends this guideline can complement the Hands-Free Profile.

1.1 Target system
The figure below shows a system diagram that this guideline specifies. The minimum functionality of the Hands-Free unit (HF) is a speaker, microphone and control switch. The Display and Sound Generator are optional.
1.2 Example of the system

![Diagram of a vehicle interior with a steering wheel, microphone, display, switch, and speaker.]

1.3 Added/Changed features from HFP 1.0 to HFP 1.5

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<td>Held incoming call terminated by caller</td>
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<tr>
<td>Subscriber Number Information</td>
<td>Subscriber Number Information</td>
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<td></td>
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1.3.1 Phone Status Information
HFP 1.0 supports “service”, “call” and “callsetup” indications. CCAP Application Guideline 1.0 adds “signal” and “battchg” indications in Appendix A. HFP 1.5 covers these indications and the further status indications.

1.3.2 Three Way Calling
HFP 1.0 specifies the basic Three Way Calling features. HFP 1.5 adds some parameters of control commands and result indications for matching the status between the AG and the HF.
1.3.3 Enhanced Call Status
These features inform the HF of each call status in the AG. The HF can detect either the AG has multiple calls or not, and what kind of calls the AG have and which status each call is through a query command and unsolicited result codes. These features are effective for matching the status between the AG and the HF in Three Way Calling.

1.3.4 Enhanced Call Control
These features are extension of Three Way Calling and shall be considered all together.

1.3.5 Response and Hold
CCAP Application Guideline 1.0 specifies the same features in Appendix A. HFP 1.5 covers these features and a query command for the AG status.

The Response and Hold features depend on the cellular network. All operators and phone manufacturers in Japan implement these features into their networks and products.

The Response and Hold features seem to be similar to the Three Way Calling. However these two features are absolutely different. The Response and Hold features are applicable only for an incoming call. The AG with a held incoming call does not accept an additional incoming call and an outgoing call. The cellular network denies any additional calls if the AG is in the Response and Hold state. On the other hand the Three Way Calling commands shall be applied when the AG has multiple calls. The Three Way Calling features shall not affect a held incoming call through the Response and Hold commands.

Therefore the Response and Hold state shall be independent with the held state through the Three Way Calling features either in the AG or the HF.

1.3.6 Subscriber Number Information
CCAP Application Guideline 1.0 specifies the same feature in Appendix A.
2. State transition assumed with Application Guideline

Following figure represents the state transition diagram that this guideline assumes when the AG (cellular phone) and the HF (hands-free Unit) operate with each other according to the Hands-Free Profile.

1. Registration
   1.1. Registration from the AG
   1.2. Registration from the AG (Already registered)

2. Connection setup
   2.1. Connection setup from the HF
   2.2. Connection setup from the AG
   2.3. Connection setup from the AG (Unregistered)
   2.4. Connection setup from the HF (Unregistered)
   2.5. Connection setup from the AG during a call in the AG
   2.6. Connection setup from the HF during an incoming call in the AG
   2.7. Connection setup from the HF during an outgoing call in the AG
   2.8. Connection setup from the HF during a call waiting in the AG
   2.9. Connection setup from the HF during a held call by three way calling in the AG
   2.10. Connection setup from the HF during a held call by response and hold in the AG

3. Service Level Connection

4. Transfer of the AG status
   4.1. Transfer of Registration Status of the AG
   4.2. Transfer of Signal Strength of the AG
   4.3. Transfer of Roaming Status of the AG
   4.4. Transfer of Battery Level of the AG
   4.5. Query of Operator Selection of the AG
   4.6. Transfer of status indicator (initiated by the HF)
   4.7. Enable the indicators status update function in the AG

6. Incoming Call
   6.1. Answer an incoming call from the HF (No in-band ringing)
   6.2. Answer an incoming call from the HF (In-band ringing)
   6.3. Answer an incoming call from the AG (No in-band ringing) (Handsfree Mode)
   6.4. Answer an incoming call from the AG (In-band ringing) (Private Mode)
   6.5. Answer an incoming call from the AG (In-band ringing) (Handsfree Mode)
   6.6. Answer an incoming call from the AG (In-band ringing) (Private Mode)
   6.7. Reject an incoming call from the HF (No in-band ringing)
   6.8. Reject an incoming call from the HF (In-band ringing)
   6.9. Reject an incoming call from the AG (No in-band ringing)
   6.10. Reject an incoming call from the AG (In-band ringing)
   6.11. Change the in-band ring tone setting
   6.12. Incoming call (Canceling the call by the remote party)

7. Terminate a call process
   6.2.1. Terminate a call process from the HF
   6.2.2. Terminate a call process from the AG
   6.2.3. Terminate a call process from the cellular network
   6.2.4. Terminate a call process from the cellular network (communication by Private Mode)

8. Connection release
   8.1. Connection release from the HF
   8.2. Connection release from the AG

9. Three Way Calling
   9.1. Setting the three way calling
   9.2. Three way calls – Third party call placed from the HF
   9.3. Three way calls – Third party call placed from the AG
   9.4. Three way calling from the HF (SEND 0)
   9.5. Three way calling from the AG (SEND 0)
   9.6. Three way calling from the HF (SEND 1)
   9.7. Three way calling from the AG (SEND 1)
   9.8. Three way calling from the HF (SEND 1<idx>) - Release Specified Call Index
   9.9. Three way calling from the AG (SEND 1<idx>) - Release Specified Call Index
   9.10. Three way calling from the HF (SEND 2)
   9.11. Three way calling from the AG (SEND 2)
   9.12. Three way calling from the HF (SEND 2<idx>) - Private Consultation Mode
   9.13. Three way calling from the AG (SEND 2<idx>) - Private Consultation Mode
   9.14. Three way calling from the HF (SEND 3)
   9.15. Three way calling from the AG (SEND 3)
   9.16. Three way calling from the HF (SEND 4)
   9.17. Three way calling from the AG (SEND 4)
13. Others

13.1. Transmitting DTMF codes
13.2. Calling line identification (CLI) notification
13.3. Turning off the AG's IC and NR
13.4. Audio connection set up from the HF
13.5. Audio connection set up from the AG
13.6. Voice recognition activation (AG initiated)
13.7. Voice recognition activation (Deactivated by the AG)
13.8. Voice recognition activation (Deactivated by the HF)
13.9. Attaching a phone number to a voice tag
13.10. Extended AG Error Results Code
13.11. Outgoing call (no network)
13.12. Subscriber Number Information

13.13. Transmitting DTMF codes
13.14. Calling line identification (CLI) notification
13.15. Turning off the AG's IC and NR
13.16. Audio connection set up from the HF
13.17. Audio connection set up from the AG
13.18. Voice recognition activation (AG initiated)
13.19. Voice recognition activation (Deactivated by the AG)
13.20. Voice recognition activation (Deactivated by the HF)
13.21. Attaching a phone number to a voice tag
13.22. Extended AG Error Results Code
13.23. Outgoing call (no network)
13.24. Subscriber Number Information

Abnormal Usage Scenarios

1. Service level connection loss during an ongoing call (the reconnection fails)
2. Outgoing call (Canceling the call process due to no service for AG)
3. Terminate a call process due to no service for AG
4. Incoming call (Canceling the call process due to no service for AG)
5. Service level connection loss during audio connection (the reconnection fails)
6. Service level connection loss during service level connection (the reconnection fails)
7. Service level connection loss and reconnection succeeded
8. Service level connection loss during the procedure (the reconnection fails)

10. Audio Conn.Transfer
11. Remote Audio Volume Control
12. Response and Hold
3. Usage scenarios

This section presents usage scenarios that illustrate specific behaviors of the AG and HF when operating in compliance with the HFP.

The objectives in showing these usage scenarios are:
- To clarify the features of the profile so as to improve the HFP for readers understanding
- To prevent readers from misunderstanding the sequence charts and parameters and thus ensure interoperability

The first table shows the proposed normal usage scenarios and the second table the abnormal scenarios. The scenarios that are not defined in HFP 1.5 are colored yellow.

**Normal / Additional Usage Scenarios**

<table>
<thead>
<tr>
<th>Scenario Name</th>
<th>Initial Status</th>
<th>Support in HF</th>
<th>Support in AG</th>
<th>Scenario Description</th>
<th>HFP Sect.</th>
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<tbody>
<tr>
<td>6.2.1.1 Registration from the AG</td>
<td>X X</td>
<td>M</td>
<td>M</td>
<td>The AG discovers the HF, and the AG and the HF negotiate the call.</td>
<td>4.11</td>
</tr>
<tr>
<td>6.2.1.2 Registration from the AG (Already registered)</td>
<td>X X</td>
<td>M</td>
<td>M</td>
<td>The AG tries to negotiate the call, but the AG has already been registered in the HF.</td>
<td>4.11</td>
</tr>
<tr>
<td>4.13.1 Memory dialing from the AG</td>
<td>X X</td>
<td>O</td>
<td>M</td>
<td>The AG starts a call by dialing a phone number.</td>
<td>4.13</td>
</tr>
<tr>
<td>4.13.2 Memory dialing from the AG (Handsfree Mode)</td>
<td>X X</td>
<td>O</td>
<td>O</td>
<td>The AG initiates an outgoing call by dialing a phone number.</td>
<td>4.13</td>
</tr>
<tr>
<td>4.14.1 Answering an incoming call from the AG (In-band ringing)</td>
<td>X X</td>
<td>M</td>
<td>M</td>
<td>The AG answers an incoming call with in-band ringing.</td>
<td>4.14</td>
</tr>
<tr>
<td>4.14.2 Answering an incoming call from the AG (No in-band ringing)</td>
<td>X X</td>
<td>M</td>
<td>O</td>
<td>The AG answers an incoming call with no in-band ringing.</td>
<td>4.14</td>
</tr>
</tbody>
</table>

**Abnormal Usage Scenarios**

<table>
<thead>
<tr>
<th>Scenario Name</th>
<th>Initial Status</th>
<th>Support in HF</th>
<th>Support in AG</th>
<th>Scenario Description</th>
<th>HFP Sect.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2.6.11 Change the in-band ring tone setting</td>
<td>X X</td>
<td>M</td>
<td>M</td>
<td>The AG informs the HF whether the AG sends in-band ringing.</td>
<td>6.2.6.11</td>
</tr>
</tbody>
</table>

Initial Status:
- X: Not Exist
- O: Optional
- M: Mandatory
- ?: Both case are assumed
### Scenario Name: SLC SCO Call

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminates a call process from the HF:** E
- **Terminates a call process from the AG:** E

---

### Scenario Name: Remote audio volume control

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Remote audio volume control:** E
  - The HF controls the AG's volume.

---

### Scenario Name: Audio connection transfer

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Audio connection transfer:** E
  - The audio connection is transferred from the HF to the AG.

---

### Scenario Name: Audio connection set up from the AG

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Audio connection set up from the AG:** E
  - The audio connection is set up from the AG.

---

### Scenario Name: Terminate a call process

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a call process from the HF:** E
  - The call process is terminated from the HF.
- **Terminate a call process from the AG:** E
  - The call process is terminated from the AG.

---

### Scenario Name: Remote audio volume control

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Remote audio volume control:** E
  - The HF controls the AG's volume.

---

### Category: 6.2.7.1 Terminate a call process from the HF

#### Scenario Name: Terminate a call process from the HF

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a call process from the HF:** E
  - The call process is terminated from the HF.

---

### Category: 6.2.10 Audio connection transfer

#### Scenario Name: Audio connection transfer towards the HF (Operated by the HF)

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Audio connection transfer towards the HF (Operated by the HF):** E
  - The audio connection is transferred from the AG to the HF, operated by the HF.

---

### Category: 6.2.8 Connection release

#### Scenario Name: Connection release from the AG

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Connection release from the AG:** E
  - The connection is released from the AG.

---

### Category: 6.2.13 Others

#### Scenario Name: Audio connection transfer

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Audio connection transfer:** E
  - The audio connection is transferred from the AG to the HF.

---

### Category: 6.2.7 Terminate a call process

#### Scenario Name: Terminate a held incoming call from the HF

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a held incoming call from the HF:** E
  - A held incoming call is terminated from the HF.

---

### Category: 6.2.10 Audio connection transfer

#### Scenario Name: Audio connection transfer towards the HF (Operated by the AG)

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Audio connection transfer towards the HF (Operated by the AG):** E
  - The audio connection is transferred from the HF to the AG, operated by the AG.

---

### Category: 6.2.8 Connection release

#### Scenario Name: Connection release from the AG

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Connection release from the AG:** E
  - The connection is released from the AG.

---

### Category: 6.2.13 Others

#### Scenario Name: Terminate a call process

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a call process:** E
  - A call process is terminated.

---

### Category: 6.2.7 Terminate a call process

#### Scenario Name: Terminate a held incoming call from the AG

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a held incoming call from the AG:** E
  - A held incoming call is terminated from the AG.

---

### Category: 6.2.13 Others

#### Scenario Name: Terminate a call process

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a call process:** E
  - A call process is terminated.

---

### Category: 6.2.8 Connection release

#### Scenario Name: Connection release from the AG

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Connection release from the AG:** E
  - The connection is released from the AG.

---

### Category: 6.2.13 Others

#### Scenario Name: Terminate a call process

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a call process:** E
  - A call process is terminated.

---

### Category: 6.2.7 Terminate a call process

#### Scenario Name: Terminate a held incoming call from the AG

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a held incoming call from the AG:** E
  - A held incoming call is terminated from the AG.

---

### Category: 6.2.13 Others

#### Scenario Name: Terminate a call process

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a call process:** E
  - A call process is terminated.

---

### Category: 6.2.8 Connection release

#### Scenario Name: Connection release from the AG

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Connection release from the AG:** E
  - The connection is released from the AG.

---

### Category: 6.2.13 Others

#### Scenario Name: Terminate a call process

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Support in HF
- **Initial Status:** E
- **Support in AG:** E

#### Scenario Description
- **Terminate a call process:** E
  - A call process is terminated.
## Abnormal Usage Scenarios

<table>
<thead>
<tr>
<th>Scenario Category</th>
<th>Scenario Name</th>
<th>Initial Status</th>
<th>Support in HF</th>
<th>Support in AG</th>
<th>Scenario Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.3 Abnormal</td>
<td>6.3.1 Service Level Connection loss during an ongoing call (reconnection fails)</td>
<td>E</td>
<td></td>
<td></td>
<td>Service Level Connection loss during an ongoing call exists and reconnection fails.</td>
</tr>
<tr>
<td></td>
<td>6.3.2 Service Level Connection loss during an ongoing call (reconnection fails)</td>
<td>E</td>
<td></td>
<td></td>
<td>Service Level Connection loss during an ongoing call exists and reconnection fails.</td>
</tr>
<tr>
<td></td>
<td>6.3.3 Service Level Connection loss during an ongoing call (reconnection fails)</td>
<td>E</td>
<td></td>
<td></td>
<td>Service Level Connection loss during an ongoing call exists and reconnection fails.</td>
</tr>
<tr>
<td></td>
<td>6.3.4 Service Level Connection loss during an ongoing call (reconnection fails)</td>
<td>E</td>
<td></td>
<td></td>
<td>Service Level Connection loss during an ongoing call exists and reconnection fails.</td>
</tr>
<tr>
<td></td>
<td>6.3.5 Service Level Connection loss during an ongoing call (reconnection fails)</td>
<td>E</td>
<td></td>
<td></td>
<td>Service Level Connection loss during an ongoing call exists and reconnection fails.</td>
</tr>
<tr>
<td></td>
<td>6.3.6 Service Level Connection loss during an ongoing call (reconnection fails)</td>
<td>E</td>
<td></td>
<td></td>
<td>Service Level Connection loss during an ongoing call exists and reconnection fails.</td>
</tr>
<tr>
<td></td>
<td>6.3.7 Service Level Connection loss during an ongoing call (reconnection fails)</td>
<td>E</td>
<td></td>
<td></td>
<td>Service Level Connection loss during an ongoing call exists and reconnection fails.</td>
</tr>
<tr>
<td></td>
<td>6.3.8 Service Level Connection loss during an ongoing call (reconnection fails)</td>
<td>E</td>
<td></td>
<td></td>
<td>Service Level Connection loss during an ongoing call exists and reconnection fails.</td>
</tr>
</tbody>
</table>

Note: **Usage Scenarios colored yellow are not defined in the HFP.**

*1 Registration from the HF is not depicted because inquiry from the HF is not defined in the HFP.
4. Basic philosophy
This section states Bluetooth connection philosophy that provides a basis for the sequence charts presented in section 6.

The objectives of this section are to:
- Help readers understand the sequence charts
- Provide guidance for sequences that are not contained in the HFP Ver1.5.

The tables in this section, have a column headed “HFP” in which the corresponding section in the Hands-Free Profile document is indicated. A dash (“-”) in the “HFP” column means that there is no corresponding description in the HFP.

4.1 Recommendations for GAP

<table>
<thead>
<tr>
<th>Item</th>
<th>HFP</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inquiry Scan (registration mode)</td>
<td>-</td>
<td>The AG/HF executes inquiry scan in the registration mode. It is recommended the HF would execute inquiry scan only in the registration mode, which is usually entered by explicit user input.</td>
<td>From a security point of view, it is not desirable that other devices can easily obtain information to be identified.</td>
</tr>
<tr>
<td>No ACL status (normal mode)</td>
<td>-</td>
<td>When there is not an ACL, it is recommended that both the AG and the HF execute page scan.</td>
<td>Both the AG and the HF may establish an ACL if necessary.</td>
</tr>
<tr>
<td>ACL status (normal mode)</td>
<td>-</td>
<td>When an ACL exists, it is recommended that the AG take a low power consumption mode (i.e. park mode, sniff mode, or hold mode). The details are described in “Recommendations for No-audio connection status”.</td>
<td>It is desirable that the HF support all of park mode, sniff mode or hold mode so that the AG use power conserving mode(s) preserving its battery life.</td>
</tr>
</tbody>
</table>

(Note)
Both the HF and the AG can be enabled to use a registration mode, in addition to supporting normal mode. Inquiry scan by the HF can be performed in the registration mode only.

(Example)
After being powered on, a HF device should periodically alternately perform paging and page scan so that the HF can establish an ACL with the AG. In this case, the AG is preferable to be operated in page scan mode.

If an ACL exists but the HF has not taken any action for certain duration, the AG may release the established ACL to enter power conserving mode(s). In this case, it is not recommended that the HF execute further paging to the AG.
4.2 Recommendation for SDP

<table>
<thead>
<tr>
<th>Item</th>
<th>HFP</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDP</td>
<td>&quot;</td>
<td>It is recommended that both the AG and the HF get the Service Record on the other device, every time when each device tries to establish an ACL.</td>
<td>Service Record on the AG and the HF may be changed.</td>
</tr>
</tbody>
</table>
### 4.3 Recommendations for “No-audio” connection status

#### Recommendations for “No-audio” connection status (1/2)

<table>
<thead>
<tr>
<th>Item</th>
<th>HFP</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Status</td>
<td>-</td>
<td>When any audio connection does not exist, it is recommended that the AG and the HF have an RFCOMM connection set up and the AG be in power conserving mode.</td>
<td>In order for the HF to receive an incoming call, it is desirable that the RFCOMM connection be kept. Power conserving mode(s) is desirable to reduce power consumption for the AG.</td>
</tr>
<tr>
<td>Master-slave role switch</td>
<td>-</td>
<td>The Bluetooth role (master or slave) is implementation dependent. It is recommended that the AG/HF issue a role switch command to/from master or slave and the receiver of the command accept the request. Even if the receiver cannot accept the request, the SLC should not be disconnected.</td>
<td>In order to ensure the behavior when the remote device requests to be master in multi-connection. Some devices tend to be master.</td>
</tr>
<tr>
<td>Park mode</td>
<td>-</td>
<td>It is recommended that the AG initiate the transition to park mode.</td>
<td>To reduce power consumption for the AG.</td>
</tr>
<tr>
<td>Sniff mode</td>
<td>-</td>
<td>It is recommended that both the AG and the HF support sniff mode.</td>
<td>To ensure power consumption reduction.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It is recommended that the AG initiate the transition to sniff mode.</td>
<td></td>
</tr>
<tr>
<td>Hold mode</td>
<td>-</td>
<td>It is recommended that the AG initiate hold mode.</td>
<td></td>
</tr>
</tbody>
</table>

(Note)

It is recommended that the HF support all power consumption modes, the park mode, sniff mode and hold mode, and also the AG be enable to support one of those three modes at least.
## Recommendations for “No-audio” connection status (2/2)

<table>
<thead>
<tr>
<th>Item</th>
<th>HFP</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL reconnection for an undesired release in park mode or sniff mode</td>
<td>-</td>
<td>If an AG/HF operating power conserving mode has an ACL, including RFCOMM connection and link loss causes the ACL to be dropped, it is recommended that the HF initiate re-establishing the ACL. Detecting of the link loss and release of the ACL is implementation dependent. An example would be the monitoring of HCI Disconnection Complete event parameters, namely 0x08 (Connection timeout). When link loss causes the release of the established ACL, it is recommended that the AG execute page scan and the HF execute both page scan and paging alternatively. If the ACL is established again, it is recommended that the HF unit do not believe previous AG status is valid. It is recommended that the HF initiate the Service Level Connection establishment procedure (AT+CIND=? etc.).</td>
<td>To ensure reconnection after the undesired ACL release in either park mode or sniff mode</td>
</tr>
<tr>
<td>Case of “no support of power conserving mode”</td>
<td>-</td>
<td>If either the AG or the HF does not support any power conserving modes, the AG may release the established ACL to reduce power consumption. If the HF has already established an ACL but there have not been any calls or data traffic for certain duration, the AG may release the ACL. In this case, it is recommended the HF execute page scan after detecting the ACL release and the AG should execute page scan. Furthermore, it is recommended that the HF do not execute paging after detecting the ACL release by the AG unless a call from the HF is initiated.</td>
<td>To cope with the case that both the AG and the HF do not support any power conserving mode(s).</td>
</tr>
</tbody>
</table>
### 4.4 Recommendation for Service Level Connection

<table>
<thead>
<tr>
<th>Item</th>
<th>HFP</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
</table>
| Service Level reconnection for an undesired release | 4.2.3 | When link loss happens to release the established Service Level Connection without a request from the AG or the HF, the HF reinitiates the Service Level Connection. [Defined in HFP 4.2.3]  
If the Service Level Connection is established again, the HF unit shall not believe that the Service Level Connection state from the previous connection is valid. [Defined in HFP 4.2.3]  
It is recommended that the HF initiate the Service Level Connection establishment procedure (AT+CIND=? etc.) [Undefined in HFP]  
It is implementation dependent that the method for detecting the Service Level Connection release led by link loss. An example method is through monitoring the status in one of HCI Disconnection Complete event parameters, namely 0x08 (Connection timeout). [Undefined in HFP]  
When link loss happens to release the Service Level Connection, it is recommended that the AG execute page scan and the HF execute both page scan and paging, respectively. [Undefined in HFP] | To ensure reconnection following undesired Service Level Connection release |
### 4.5 Recommendations for normal / additional sequence

<table>
<thead>
<tr>
<th>Item</th>
<th>HFP</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing of audio connection set up in outgoing call</td>
<td>-</td>
<td>When the AG sets up an outgoing call based on a request from the HF and there is not an audio connection, it is recommended that the AG establish an audio connection before setting up the outgoing call to the cellular network.</td>
<td>The HF can confirm outgoing call status by detecting tones (ring back tone, busy tone, and so forth).</td>
</tr>
<tr>
<td>Timing of audio connection release in terminating a call and rejecting an incoming call with in-band ringing</td>
<td>-</td>
<td>When the user initiates the termination of a call or rejects an incoming call with in-band ringing at both the AG and the HF, it is recommended that the AG release the established audio connection before either terminating an ongoing call or rejecting an incoming call.</td>
<td>To avoid any uncomfortable noise in the HF.</td>
</tr>
<tr>
<td>AG timing of audio connection set up in incoming call (no in-band ringing, audio absent)</td>
<td>-</td>
<td>When there is an incoming call with no in-band ringing and there is not an audio connection and the HF requests that the call be answered, it is recommended that the AG establish an audio connection before answering the incoming call to the cellular network.</td>
<td>To avoid missing the beginning of the call.</td>
</tr>
<tr>
<td>HF timing of audio switching in incoming call (no in-band ringing, audio present)</td>
<td>-</td>
<td>When there is an incoming call with no in-band ringing and there is an audio connection, the HF outputs the local ring tone. To answer the incoming call from the HF, it is recommended that the HF switch its internal audio path from the sound generator to the Bluetooth audio when the audio connection is established.</td>
<td>To define the timing to switch the audio path in the HF.</td>
</tr>
<tr>
<td>HF timing of audio switching in incoming call (no in-band ringing, audio absent)</td>
<td>-</td>
<td>When there is an incoming call with no in-band ringing and there is not an audio connection, either the HF or the AG outputs the local ring tone. To answer the incoming call from the HF, it is recommended that the HF switch its internal audio path from the sound generator to the Bluetooth audio when the audio connection is established.</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>HFP</td>
<td>Recommendation</td>
<td>Reason</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td>Stopping the local ring tone when canceling /rejecting an incoming call (no in-band ringing).</td>
<td>-</td>
<td>When either the AG or the HF terminates an incoming call with no in-band ringing via canceling /rejecting the incoming call, the local ring tone should be stopped. It is recommended that the local ring tone be stopped when the HF receives +CIEV (callsetup=0).</td>
<td>To define the timing to stop the local ring tone in the HF.</td>
</tr>
<tr>
<td>Stopping the local ring tone when answering an incoming call from the AG</td>
<td>-</td>
<td>When the AG answers an incoming call with no in-band ringing, the local ring tone should be stopped. It is recommended that the local ring tone be stopped when the HF receives +CIEV (callsetup=0).</td>
<td></td>
</tr>
<tr>
<td>Behavior of the AG when the HF not supporting 3-way calling</td>
<td>-</td>
<td>When the HF does not support 3-way calling, it is recommended that the AG control the HF with regular commands which could be understood by the HF.</td>
<td>To avoid state mismatch between the HF and the AG.</td>
</tr>
<tr>
<td>Handling of the audio connection when answering a call from the AG or the HF</td>
<td>-</td>
<td>When the AG answers an incoming call or a held incoming call, it is recommended that the audio connection be terminated. When the HF answers an incoming call or a held incoming call, it is recommended that the audio connection be established.</td>
<td>To define how to handle the audio connection when either the AG or the HF answers a call.</td>
</tr>
<tr>
<td>Handling of the audio connection when an incoming call is put on hold from the AG or the HF</td>
<td>4.29.3</td>
<td>When the AG puts an incoming call on hold, it is recommended that the audio connection be not changed. When the HF puts an incoming call on hold, it is recommended that the audio connection be established.</td>
<td>To define how to handle the audio connection when either the AG or the HF puts an incoming call on hold.</td>
</tr>
<tr>
<td>Handling of the audio connection when a call is not active</td>
<td>-</td>
<td>When a call is not active, it is recommended that the audio connection be terminated except the case of voice recognition activation, AT+BVRA=1 or +BVRA:1.</td>
<td>To define how to handle the audio connection when a call is not active.</td>
</tr>
</tbody>
</table>
### 4.6 Recommendations for abnormal sequences

<table>
<thead>
<tr>
<th>Item</th>
<th>HFP</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Level Connection link loss during a call</td>
<td>4.2.3</td>
<td>When the Service Level Connection link loss occurs during a call, it is recommended that the HF try to establish the new Service Level Connection [Defined in HFP 4.2.3].</td>
<td>-</td>
</tr>
<tr>
<td>Service Level Connection link loss during an audio connection</td>
<td>-</td>
<td>When the Service Level Connection link loss occurs during an audio connection and no call exists, it is recommended that the HF try to establish the new Service Level Connection and the AG wait for the service level reconnection to complete for the defined time (Twaitslc).</td>
<td>To re-establish the audio connection following the Service Level Connection link loss</td>
</tr>
<tr>
<td>Service Level Connection link loss during Service Level Connection</td>
<td>-</td>
<td>If the Service Level Connection link loss occurs while no call is active, it is recommended that the HF initiate the establishment of the new Service Level Connection. If the Service Level Connection is established again, the HF unit shall not believe that the Service Level Connection state from previous connection is valid. It is recommended that the HF initiate the Service Level Connection establishment procedure (AT+CIND=?.etc.).</td>
<td>To re-establish the Service Level Connection in the case of link loss</td>
</tr>
</tbody>
</table>

(Note)
When Service Level Connection link loss is detected, the AG may take one of the actions below:
- Terminate the ongoing call immediately.
- Keep the ongoing call active for certain duration. (It is implementation dependant.)
  (For example, some users may set specific time parameters on the AG, which define the duration until the ongoing call is terminated.)
- Maintain the ongoing call.

When the new Service Level Connection is established and there is an ongoing call, the AG is responsible for choosing whether the call is transferred from the AG to the HF or not. This is left as an implementation choice for the AG design. (It should be noted that the existing ongoing call is not always the same as the call before link loss). Following implementations are examples.

1. The ongoing call may be transferred to the HF by user judgment and operation.
2. If the existing ongoing call is same as the one before link loss by AG judgment, the audio connection may be transferred to the HF autonomously.
   - User may choose whether the audio connection is transferred to the HF autonomously or not.
### 4.7 Recommendations for Response and Hold

#### Recommendations for Response and Hold

<table>
<thead>
<tr>
<th>Item</th>
<th>HFP</th>
<th>Recommendation</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holding tone</td>
<td>4.29.2</td>
<td>If the SDP record of the AG or +BSIR result code shows that in-band ring tone capability is off, it is recommended the HF generate holding tone.</td>
<td>If the AG cannot transmit its generating tone over audio connection, the HF generates holding tone.</td>
</tr>
<tr>
<td>Holding tone switch timing (no in-band ringing)</td>
<td>4.29.2</td>
<td>When there is an incoming call with no in-band ring and the HF puts an incoming call on hold, the HF switches generating tone from ring tone to holding tone. It is recommended the HF switch tone when a proper result code is transmitted to the HF.</td>
<td>To define the timing to switch audio path in the HF.</td>
</tr>
<tr>
<td>HF timing of audio switching in accepting a held call (no in-band ringing, audio present)</td>
<td>4.29.4</td>
<td>When there is audio connection and a HF held call with no in-band ringing, the HF outputs local holding tone. About accepting the held call from the HF, it is recommended the HF switch the audio path from local holding tone to audio on audio connection when a proper result code is transmitted to the HF.</td>
<td>To define the timing to switch audio path in the HF.</td>
</tr>
<tr>
<td>HF timing of audio switching in incoming call (no in-band ringing, audio absent)</td>
<td>4.29.4</td>
<td>When there is no audio connection and an incoming call with no in-band ringing, the HF outputs local holding tone. About accepting the held call from the HF, it is recommended the HF switch the audio path from local holding tone to audio on audio connection when audio connection is setup.</td>
<td>To define the timing to switch audio path in the HF.</td>
</tr>
<tr>
<td>HF timing of audio switching in rejecting or terminating a held call (no in-band ringing, audio present)</td>
<td>4.29.6</td>
<td>When there is audio connection and a HF held call with no in-band ringing, the HF outputs local holding tone. About rejecting the held call from the HF or terminating the held call from the caller, it is recommended the HF switch audio path from local holding tone to audio on audio connection when a proper result code is transmitted to the HF.</td>
<td>To define the timing to switch audio path in the HF.</td>
</tr>
<tr>
<td>HF timing to stop local holding tone (no in-band ringing, audio absent)</td>
<td>4.29.6</td>
<td>When there is no audio connection and a HF held call with no in-band ringing, the HF outputs local holding tone. About rejecting the held call from the HF or terminating the held call from the caller, it is recommended the HF stop local holding tone when a proper result code is transmitted from to the HF.</td>
<td>To define the timing to switch audio path in the HF.</td>
</tr>
</tbody>
</table>
5. Parameters
This section describes the CCAP recommendations for parameters and ranges. The objective is to realize better connectivity between the AG and the HF. The parameters indicated in this section are shown according to the scenario categories.
## 5.1 Registration

### HF registration parameters

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inquiry scan</td>
<td>Inquiry_scan_interval</td>
<td>Less than or equal to 1.28 sec</td>
<td>For fast connectivity</td>
<td>HCI  7.3.21</td>
</tr>
<tr>
<td></td>
<td>Inquiry_scan_window</td>
<td>More than or equal to 11.25 msec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interlaced inquiry scan</td>
<td>Inquiry_scan_interval</td>
<td>Less than or equal to 2.56 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inquiry_scan_window</td>
<td>More than or equal to 11.25 msec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Page scan</td>
<td>Page_scan_interval</td>
<td>Less than or equal to 1.28 sec</td>
<td></td>
<td>HCI  7.3.19</td>
</tr>
<tr>
<td></td>
<td>Page_scan_window</td>
<td>More than or equal to 11.25 msec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interlaced Page scan</td>
<td>Inquiry_scan_interval</td>
<td>Less than or equal to 1.28 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inquiry_scan_window</td>
<td>More than or equal to 11.25 msec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device name</td>
<td>Name_length</td>
<td>Less than or equal to 20 characters</td>
<td>The AG can show the device name of the HF.</td>
<td>GAP  3.2.2</td>
</tr>
<tr>
<td></td>
<td>Device name</td>
<td>US-ASCII printable code + blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Link policy setting</td>
<td>Master slave switch</td>
<td>Support</td>
<td>The AG can freely become a master or a slave and realize low power consumption.</td>
<td>HCI  7.2.9</td>
</tr>
<tr>
<td>SCO packets</td>
<td>HV1/HV2/HV3</td>
<td>HV1 is selected for better audio quality.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>eSCO packets</td>
<td>EV3/2-EV3</td>
<td>HV1/HV2/HV3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Link supervision timeout</td>
<td>Link_supervision_timeout</td>
<td>Less than or equal to 5.12 sec</td>
<td>To detect a link loss in the defined time.</td>
<td>HCI  7.3.43</td>
</tr>
<tr>
<td>Security</td>
<td>Security mode</td>
<td>Security mode 2/3 (It is recommended that the HF accept any security mode 1,2,3 the AG uses)</td>
<td>To ensure security</td>
<td>GAP  5.2</td>
</tr>
<tr>
<td></td>
<td>Passcode length</td>
<td>Greater than or equal to 4</td>
<td>To ensure minimum security</td>
<td>GAP  3.2.3</td>
</tr>
<tr>
<td></td>
<td>Passcode character code</td>
<td>0x30-0x39</td>
<td>The user can easily enter the Passcode.</td>
<td></td>
</tr>
</tbody>
</table>

*1 It is also recommended to support HV2 and HV3 considering multiple profiles. If the HF requires HV1 but the AG replies HV3, it is recommended the HF and the AG adopt HV3.
### AG registration parameters

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page scan</td>
<td>Page_scan_Interval</td>
<td>-</td>
<td></td>
<td>HCI 7.3.19</td>
</tr>
<tr>
<td></td>
<td>Page_scan_Window</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interlaced Page</td>
<td>Inquiry_scan_interval</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>scan</td>
<td>Inquiry_scan_window</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device name</td>
<td>Name_length</td>
<td>Less than or equal to 12</td>
<td>The HF can show its device name.</td>
<td>GAP 3.2.2</td>
</tr>
<tr>
<td></td>
<td>Device name</td>
<td>US-ASCII printable code + blank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Link policy</td>
<td>Master slave switch</td>
<td>Support</td>
<td>The AG can freely become a master or a slave and realize low power consumption.</td>
<td>HCI 7.2.9</td>
</tr>
<tr>
<td>setting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCO packets</td>
<td>HV1/HV2/HV3</td>
<td>HV1 is selected for better audio quality.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>eSCO packets</td>
<td>EV3/2-EV3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Link supervision</td>
<td>Link_supervision_timeout</td>
<td>Less than or equal to 5.12 sec</td>
<td>To detect a link loss in a defined time.</td>
<td>HCI 7.3.43</td>
</tr>
<tr>
<td>timeout</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td>Security mode</td>
<td>Security mode 2/3 (It is recommended that the AG accept any security mode 1,2,3 the HF uses)</td>
<td>To ensure security</td>
<td>GAP 5.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passcode</td>
<td>AG shall accept the fixed Passcode the HF is adopting</td>
<td>The HF may have only fixed Passcode.</td>
<td></td>
<td>GAP 3.2.3</td>
</tr>
<tr>
<td>Passcode length</td>
<td>Basically, the fixed Passcode of the HF is used. If Passcode of the AG is used, its length is greater than or equal to 4.</td>
<td>User can easily enter the Passcode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passcode character code</td>
<td>Basically, the fixed Passcode of the HF is used. If Passcode of the AG is used, the character codes for the Passcode is from 0x30 to 0x39.</td>
<td>To ensure the user entering the Passcode</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 It is also recommended to support HV2 and HV3 considering multiple profiles. If the AG requires HV1 but the HF replies HV3, it is recommended the HF and the AG adopt HV3.
5.2 Connection set up

AG, HF park, sniff, hold parameters

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park mode</td>
<td>Beacon_max_interval</td>
<td>Less than or equal to 1.28 sec</td>
<td>For fast connectivity</td>
<td>HCI 7.2.4</td>
</tr>
<tr>
<td>Sniff mode</td>
<td>Sniff_max_interval</td>
<td>Less than or equal to 1.28 sec</td>
<td>For fast connectivity</td>
<td>HCI 7.2.2</td>
</tr>
<tr>
<td>Hold mode</td>
<td>Hold_mode_max_interval</td>
<td>Less than or equal to 1.28 sec</td>
<td>For fast connectivity</td>
<td>HCI 7.2.1</td>
</tr>
</tbody>
</table>

5.3 Outgoing call

Busy timeout time

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busy timeout</td>
<td>Tbusy</td>
<td>5 sec</td>
<td>To stop sending busy tone from the AG in the defined time</td>
<td>HFP 4.18</td>
</tr>
</tbody>
</table>

5.4 Incoming call

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.5 Terminate a call process

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.6 Connection release

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.7 Three way calling

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 5.8 Audio connection transfer

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5.9 Remote audio volume control

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5.10 Others

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5.11 Abnormal sequences

Waiting time in loss during Service Level Connection

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waiting time in loss during Service Level Connection</td>
<td>Twaitslc</td>
<td>60 sec</td>
<td>To reinitiate Service Level Connection in the defined time.</td>
<td>-</td>
</tr>
</tbody>
</table>

### 5.12 Callsetup

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>+CIND</td>
<td>callsetup indicator</td>
<td>It is desirable that the HF supports both “callsetup” and “call_setup” as the callsetup status indicator. It is also recommended the HF work correctly even if the AG supports neither “callsetup” nor “call_setup”.</td>
<td>For backward compatibility with previous versions of the profile</td>
<td>HFP 4.33.2</td>
</tr>
</tbody>
</table>
### 5.13 Signal strength and Battery level

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Value, range</th>
<th>Reason</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>+CIND</td>
<td>Indicator</td>
<td>&lt;ind&gt;</td>
<td>It is desirable that “signal” and “battchg” are supported by the AG in addition to “service”, “call” and “callsetup”</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>To indicate the signal strength and the battery level on the HF screen.</td>
<td>HFP</td>
</tr>
<tr>
<td>+CIEV</td>
<td>current status of the indicator</td>
<td>&lt;value&gt;</td>
<td>0-5*</td>
<td></td>
</tr>
</tbody>
</table>

* For the AG or the HF that handles the signal strength and/or the battery level internally with value of 0-3, it is recommended that the internal value and the +CIEV parameter be converted as follows:

<table>
<thead>
<tr>
<th>AG internal value</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>+CIEV parameter</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>HF internal value</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

For example, if the signal strength is handled internally with value 0-3 in the AG and its current strength is 2, the parameter of +CIEV result code should be 3. If the battery level is handled internally with value 0-3 in the HF and it received +CIEV with parameter “4”, it should be translated to 2 as an internal value of the HF.
6. Sequence charts
The following sequence charts are provided as the implementation references. These sequence charts shall not define transmission order of AT commands and indicators in each cases.

6.1 Conventions used in sequence charts
audio sent by AG over SCO link

audio sent by AG or Network over SCO link

two way voice communication over SCO link

call procedure

optional condition

optional procedure

optional signal

simplified procedure

procedure A

remarkable one in procedure A

remarkable signal in procedure A
6.2 Normal/Additional Usage Scenarios
6.2.1 Registration
6.2.1.1 Registration from the AG

- device inquiry
- inquiry(GIAC)
- inquiry_res
- list of discovered device addresses
- name discovery (GAP6.3)
- list of discovered device names
- select device (initiate bonding)
- link establishment (GAP7.1)
- paging
- request a PIN
- input a PIN
- LMP pairing (GAP10.2)
- automatic input
- create and store a link key
- delete link key to paged device

- if security mode is 3
- if HF's PIN is fixed

Cellular Phone (AG)
This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0 or later. See the sequence of “Service level connection setup”.

if a HFP service level connection is needed

- registration completed
- service level connection established
- service level connection released
- service level connection release (HFPv4.3)
- SDP inquiry
- SDP response
- SDP inquiry
- SDP response
- service level connection setup (HFPv4.2)
- LMP_detach
- registration completed
6.2.1.2 Registration from the AG (Already registered)

- **Car Equipment (HF)**
  - HMI
  - HF

- **Cellular Phone (AG)**
  - AG
  - HMI

- **Cellular Network**

- **device inquiry**
- **inquiry(GIAC)**
- **inquiry_res**

- **list of the discovered device addresses**
- **name discovery** (GAP6.3)

- **list of the discovered device names**
- **select device (initiate bonding)**

- **delete link key to paged device**

- **link establishment** (GAP7.1)
- **paging**

- **request a PIN**
- **input a PIN**

- **create a link key**
- **create and store a link key**

- **confirm to overwrite a link key**
- **accept to overwrite a link key**

- **overwrite a link key**

- **if security mode is 3**
  - automatic input

- **if HF's PIN is fixed**
  - automatic input

- **create a link key**
  - **LMP pairing** (GAP10.2)

- **request a PIN**
  - **input a PIN**
If a HFP service level connection is needed:

- **Registration completed**
- **Service level connection established**
- **Service level connection released**
  - **LMP_detach**

This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0 or later. See the sequence of "Service level connection setup".
6.2.2 Connection setup

6.2.2.1 Connection setup from the HF

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
<td></td>
</tr>
<tr>
<td>HF</td>
<td>HMI</td>
<td></td>
</tr>
</tbody>
</table>

- select device
- if security mode is 3
- link establishment (GAP7.1)
- paging
- authentication using the link key and link establishment
- service level connection setup (HFP4.2)
- SDP inquiry
- SDP response
- SDP inquiry
- SDP response
- authentication completed and service level connection established
- authentication completed and service level connection established

This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0 or later. See the sequence of "Service level connection setup".
6.2.2.2 Connection setup from the AG

- **select device**
- **link establishment (GAP7.1)**
- ** paging**
- **authentication using the link key and link establishment**
- **service level connection setup (HFP4.2)**
- **SDP inquiry**
- **SDP response**
- **SDP inquiry**
- **SDP response**
- **authentication completed and service level connection established**

If security mode is 3, authentication completed and service level connection established.

This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0 or later. See the sequence of "Service level connection setup".
6.2.2.3 Connection setup from the AG (Unregistered)

- Select device
- Link establishment (GAP 7.1)
- Paging
- LMP _au_rand
- LMP_not_accepted (key missing)
- Request a PIN
- Input a PIN or input a fixed PIN automatically
- LMP pairing (GAP 10.2)
- Request a PIN
- Create and store a link key
- Service level connection setup (HFP 4.2)
- SDP inquiry
- SDP response
- SDP inquiry
- SDP response
- Authentication completed and service level connection established

This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0 or later. See the sequence of "Service level connection setup".
6.2.2.4 Connection setup from the HF (Unregistered)

- **Select device**
- **Link establishment** (GAP7.1)
- **Paging**
- **LMP_au_rand**
- **LMP_not_accepted** (key missing)
- **Request a PIN**
- **Input a PIN or input a fixed PIN automatically**
- **Create and store a link key**
- **LMP pairing** (GAP10.2)
- **Authentication completed and service level connection established**
- **Service level connection setup** (HFP4.2)
- **SDP inquiry**
- **SDP response**

This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0 or later. See the sequence of "Service level connection setup".
6.2.2.5 Connection setup from the HF during a call in the AG

If security mode is 3, authentication using the link key and link establishment must be completed. If authentication is successful, service level connection setup (HFP4.2) is performed. If both AG and HF support HF v1.0 or later, the AT+BRSF command can be used to retrieve the AG Supported Feature information. This SDP may not be needed if both AG and HF support HF v1.0 or later.

Voice communication

Authentication completed and service level connection established

Select device

Link establishment (GAP7.1)

Paging

Authentication using the link key and link establishment

Service level connection setup (HFP4.2)

SDP inquiry

SDP response

SDP inquiry

SDP response

Authentication completed and service level connection established

Call active

If security mode is 3, the value indicating "call=1" must be transferred during Service level connection setup.

This SDP may not be needed because HF is able to retrieve AG Supported Feature information with AT+BRSF command if both AG and HF support HF v1.0 or later. See the sequence of "Service level connection setup".

If security mode is 3, the value indicating "call=1" must be transferred during Service level connection setup.

If security mode is 3, the value indicating "call=1" must be transferred during Service level connection setup.
6.2.2.6 Connection setup from the HF during an incoming call in the AG

If security mode is 3, authentication using the link key and link establishment.

Service level connection setup (HFP 4.2)

SDP inquiry

SDP response

SDP inquiry

SDP response

The value indicating "callsetup=1" must be transferred during Service level connection setup.

The value indicating "callsetup=1" must be transferred during Service level connection setup.

Authentication completed and service level connection established
Audio Connection setup (HFP4.11)
RING ALERT
+CLIP nnn
in-band ring tone
alert the incoming call
the CLI nnn

If audio connection is not present, audio connection established.
If CLI is sent from network, alert the incoming call the CLI nnn.
If CLI is sent from network, alert the incoming call the CLI nnn.

In the case of the AG has in-band ring tone feature. If the AG does not have the in-band ring tone feature, the HF shall generate ring tone.
repetition
6.2.2.7 Connection setup from the HF during an outgoing call in the AG

- Select device
- Link establishment (GAP7.1)
- Paging
- Authentication using the link key and link establishment
- Service level connection setup (HFP4.2)
- SDP inquiry
- SDP response
- SDP inquiry
- SDP response
- +CIND:(value)
- Authentication completed and service level connection established
- The value indicating "callsetup=2/3" must be transferred during Service level connection setup.
- Ring back tone
6.2.2.8 Connection setup from the HF during a call waiting in the AG

- If security mode is 3, authentication using the link key and link establishment.
- Link establishment (GAP 7.1)
- Paging
- Authentication completed and service level connection established
- SDP inquiry
- SDP response
- SDP inquiry
- SDP response
- +CCWA: nnn
- +CIND: (value)

The values indicating "callsetup=1" and "call=1" must be transferred during Service level connection setup.

Voice communication X

Waiting call Y

Select device
6.2.2.9 Connection setup from the HF during a held call by three way calling in the AG

- Select device
- If security mode is 3
- Link establishment (GAP7.1)
- Paging
- Authentication using the link key and link establishment
- Service level connection setup (HFP4.2)
- SDP inquiry
- SDP response
- SDP inquiry
- SDP response
- +CIND:(value)
- Authentication completed and service level connection established

The values indicating "call=1" and "callheld=1" must be transferred during Service level connection setup.

Held call X
Voice communication Y

The values indicating "call=1" and "callheld=1" must be transferred during Service level connection setup.
6.2.2.10 Connection setup from the HF during a held call by response and hold in the AG

If security mode is 3, authentication using the link key and link establishment (GAP7.1) is performed. Paging is then initiated. After authentication completed and service level connection established, SDP inquiry and SDP response are exchanged. The value indicating "call=1" must be transferred during Service level connection setup.

The value indicating "call=1" must be transferred during Service level connection setup.
6.2.3 Service level connection setup

Service Level Connection setup

- Cellular Network
- Cellular Phone (AG)
- HMI
- Car Equipment (HF)

Service Level Connection setup (HFP 4.2)

The HF sends its supported features to the AG, then the AG returns its supported features.

The HF notifies the AG about its own available codecs if it supports the Codec Negotiation Feature.

The HF retrieves the information describing the indicators supported in the AG.

The HF requests the current status of the indicators in the AG.

The HF requests enabling indicator status in the AG.

The HF may retrieve the information describing the call hold and multiparty services supported in the AG.

- AT+BRSF=<HF supported features>
  - +BRSF=<AG supported
  - OK

- AT+CIND=?
  - +CIND:xxxx...
  - OK

- AT+CIND?
  - CIND:(current state of descriptors)
  - OK

- AT+CMER=x,x,x,x
  - OK

- AT+CHLD=?
  - +CHLD:...
  - OK

- AT+BAC=<HF Available
  - OK

The HF notifies the AG about its own available codecs if it supports the Codec Negotiation Feature.
6.2.4 Transfer of the AG status
6.2.4.1 Transfer of Registration Status of the AG

If the network registration status of the AG is changed,

service=0: no service
service=1: presence of service

update the HF’s indicator
6.2.4.2 Transfer of Signal Strength of the AG

If the signal strength status of the AG is changed, signal=0: MIN
……
signal=5: MAX

This indicator may be transferred periodically due to the AG implementation.
6.2.4.3 Transfer of Roaming Status of the AG

If the roaming status of the AG is changed,
  roam=0: roaming is not active
  roam=1: roaming is active

update the HF's indicators

+CIEV : (roam = 0/1)
6.2.4.4 Transfer of Battery Level of the AG

If the battery level of the AG is changed, battchg=0: MIN  
……  
battchg=5: MAX

This indicator may be transferred periodically due to the AG implementation.
6.2.4.5 Query of Operator Selection of the AG

set the network name format to long alphanumeric (only need to be sent once)

request current network name

AT+COPS = 3, 0

OK

AT+COPS ?

+COPS: <mode>, 0, <operator>

OK

The AG reports the current network operator name in long alphanumeric format.
6.2.4.6 Transfer of status indicator (initiated by the HF)

request the current status of the indicators in the AG

AT+CIND?

+CIND: …

OK

update the HF’s indicators

The AG reports the current status (value) of each indicator as the order in the +CIND result code, response for AT+CIND=?, during Service Level Connection.
6.2.4.7 Enable the indicators status update function in the AG

activate “indicator events reporting”
result code +CIEV
AT+CMER=3,0,0,1
enable the Indicator Status update
OK
6.2.5 Outgoing call
6.2.5.1 Last number re-dial from the HF

If audio connection is not present

If the AG enables to transfer ring back tone over audio connection

Start the call establishment procedure using the last phone number dialed by the AG

Voice communication

Call active

Audio connection established

Audio connection setup (HFP 4.11)

AT+BLDN

OK

+CIEV : (callsetup = 2)

Service Level Connection (HFP)

Redialing
6.2.5.2 Memory dialing from the HF

- **Memory dialing**
  - `ATD>nnn;`  
  - OK

- **Audio connection setup** (HFP4.11)
  - `+CIEV: (callsetup = 2)`

- **Service Level Connection (HFP)**
  - `+CIEV: (callsetup = 3)`

- **Ring back tone**
  - `+CIEV: (call = 1)`

- **Call active**
  - `+CIEV: (callsetup = 0)`

- **Voice communication**

---

**Notes:**
- If audio connection is not present, the call establishment procedure will be interrupted.
- If the AG enables to transfer ring back tone over audio connection, the call will be established.
6.2.5.3 Placing a call with the phone number supplied by the HF

- If the AG enables to transfer ring back tone over audio connection:
  - `+CIEV : (callsetup = 3)`
- The call established:
  - `+CIEV : (call = 1)`
  - `+CIEV : (callsetup = 0)`
- Call active:
  - Voice communication
- Service Level Connection (HFP)
- Audio connection setup (HFP4.11)
- Audio connection established
- Ring back tone
- if audio connection is not present:
  - Audio connection setup (HFP4.11)
  - Audio connection established
- dialing
- ATDdddddd...;
- OK
- `+CIEV : (callsetup = 2)`
- Start the call establishment procedure using the phone number ddddd
- if the AG enables to transfer ring back tone over audio connection:
  - Audio connection established
- Call active
- Voice communication
6.2.5.4 Placing a call initiated by the AG (Private Mode)

Attention:
This sequence may be selected by the AG. See "Placing a call initiated by the AG (Handsfree Mode)".

if audio connection is present

audio connection released

start the call establishment procedure

ring back tone

the call established

call active

+CIEV : (callsetup = 0)

+CIEV : (call = 1)

+CIEV : (callsetup = 3)

+CIEV : (callsetup = 2)

Service Level Connection (HFP)

dialing

Car Equipment (HF)

HMI | HF

Cellular Phone (AG)

AG | HMI

Cellular Network

Attention:
This sequence may be selected by the AG. See "Placing a call initiated by the AG (Handsfree Mode)".

audio connection release (HFP4.12)

if audio connection is present

+CIEV : (callsetup = 1)
6.2.5.5 Placing a call initiated by the AG (Handsfree Mode)

Attention:
This sequence may be selected by the AG. See "Placing a call initiated by the AG (Private Mode)".

if audio connection is not present

Service Level Connection (HFP)

audio connection established

+CIEV : (callsetup = 2)

start the call establishment procedure

ring back tone

+CIEV : (callsetup = 3)

the call established

+CIEV : (call = 1)

+CIEV : (callsetup = 0)

call active

voice communication

+CIEV : (callsetup = 0)
### 6.2.5.6 Outgoing call (Busy)

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>HF</td>
<td>AG</td>
</tr>
</tbody>
</table>

- **Service Level Connection (HFP)**
  - **Dialing**
  - **Outgoing call procedure**
  - **Start the call establishment procedure**

**If the AG enables to transfer busy tone over audio connection**

- **Busy tone**

**If user terminates from the HF**

- **Terminate**
- **AT+CHUP(END)**
- **OK**
- **Audio connection released**
- **Call process terminated**
- **+CIEV : (callsetup = 0)**
- **Audio connection released**
- **Audio connection released**

**As the AG must know the remote party is busy. The AG is able to start the timer.**

**If audio connection is present**

- **Audio connection released**
- **Call process terminated**
- **+CIEV : (callsetup = 0)**
- **Audio connection released**
- **Audio connection released**

**If user terminates from the AG**

- **Audio connection released**
- **Call process terminated**
- **+CIEV : (callsetup = 0)**
- **Audio connection released**
- **Audio connection released**

**If user doesn't terminate**

- **Audio connection released**
- **Call process terminated**
- **+CIEV : (callsetup = 0)**
- **Audio connection released**
- **Audio connection released**

**If audio connection is present**

- **Audio connection released**
- **Call process terminated**
- **+CIEV : (callsetup = 0)**
- **Audio connection released**
- **Audio connection released**

- **Constant time T_busy**
- **Audio connection released**
- **Audio connection released**
- **Audio connection released**
- **Audio connection released**

<table>
<thead>
<tr>
<th>+CIEV : (callsetup = 0)</th>
<th>Audio connection released</th>
</tr>
</thead>
<tbody>
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<td>+CIEV : (callsetup = 0)</td>
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<td>+CIEV : (callsetup = 0)</td>
<td>Audio connection released</td>
</tr>
</tbody>
</table>
6.2.5.7 Outgoing call from the AG (Canceling the call)

In the case of canceling by the HF:
- if audio connection is present
  - audio connection released
  - call process terminated
- +CIEV: (callsetup = 2)
- AT+CHUP(END)
- OK
- +CIEV: (callsetup = 0)

In the case of canceling by the AG:
- if audio connection is present
  - audio connection released
  - call process terminated
- +CIEV: (callsetup = 0)

Cellular Network
Cellular Phone (AG)  |  Car Equipment (HF)
AG         |  HMI
HMI        |  HF

Service Level Connection (HFP)

start the call establishment procedure
cancel the call establishment procedure
cancel the outgoing call
cancel the outgoing call
audio connection released
audio connection released
audio connection released
audio connection released

call process terminated
call process terminated

dialing

Version 1.5

MCPC TR-002 Hands-Free Profile 1.5 Guideline Version 1.51
### 6.2.5.8 Outgoing call from the HF (Canceling the call)

**Service Level Connection (HFP)**

- **In the case of canceling by the HF**
  - **if audio connection is present**
    - audio connection released
    - call process terminated
  - **if audio connection is present**
    - audio connection released
    - cancel the outgoing call

- **In the case of canceling by the AG**
  - **if audio connection is present**
    - audio connection released
    - call process terminated
  - **if audio connection is present**
    - audio connection released
    - cancel the outgoing call

**Cellular Network**

- **Cellular Phone (AG)**
  - **AG HMI**
  - **Cellular Phone (AG)**
  - **Cellular Phone (AG)**

- **Car Equipment (HF)**
  - **HMI HF**
  - **Car Equipment (HF)**
  - **Car Equipment (HF)**
6.2.6 Incoming call
6.2.6.1 Answer an incoming call from the HF (No in-band ringing)

- **Incoming call**
- **Answer an incoming call from the HF (No in-band ringing)**

**Diagram Description**:
- **Car Equipment (HF)**
  - **HMI**
  - **HF**
- **Cellular Phone (AG)**
  - **AG**
  - **HMI**
- **Cellular Network**

1. **Incoming call**
2. **Alert the incoming call**
3. **CLI nnn**
4. **Ring tone**
5. **Accept**
6. **ATA**
7. **OK**
8. **Audio connection established**
9. **Start the call establishment procedure and the call established**

**Call Setup**:
- **+CIEV: (callsetup = 1)**
- **+CIEV: (callsetup = 0)**

**Voice Communication**

**Network Interaction**
- **Service Level Connection (HFP)**
- **+CLIP nnn**
- **RING ALERT**
- **CLI nnn**
- **Audio connection setup (HFP4.11)**

**Status**
- **Call active**
- **Call established**
6.2.6.2 Answer an incoming call from the HF (In-band ringing)

- **Incoming call**
- **Cellular Network**
- **Cellular Phone (AG)**
  - AG
  - HMI
- **Car Equipment (HF)**
  - HMI
  - HF

**Audio Connection Setup (HFP4.11)**

- Audio connection established
- Alert the incoming call
- CLI nnn

**RING ALERT**

- +CLIP nnn

**in-band ring tone**

- Alert the incoming call
- CLI nnn

**if audio connection is not present**

**START**

- OK

**if CLI is sent from network**

**Service Level Connection (HFP)**

- +CIEV : (callsetup = 1)

Voice communication

**if audio connection is not present**

Start the call establishment procedure and the call established

- +CIEV : (call = 1)
- +CIEV : (callsetup = 0)

Call active

- +CIEV : (call = 1)
- +CIEV : (callsetup = 0)
6.2.6.3 Answer an incoming call from the AG (No in-band ringing) (Private Mode)

Attention:
This sequence may be selected by the AG. See "Answer an incoming call from the AG (No in-band ringing) (Handsfree Mode)".

If CLI is sent from network

- CLI nnn

If CLI is sent from network

- CLI nnn

Ring tone

Alert the incoming call

RING ALERT

+CLIP nnn

Start the call establishment procedure and the call established

+CIEV : (callsetup = 0)

Call active

Voice communication

Accept

Start the call establishment procedure and the call established

+CIEV : (call = 1)

Service Level Connection (HFP)

Incoming call

Attention:
This sequence may be selected by the AG. See "Answer an incoming call from the AG (No in-band ringing) (Handsfree Mode)".
6.2.6.4 Answer an incoming call from the AG (No in-band ringing) (Handsfree Mode)

Attention:
This sequence may be selected by the AG. See "Answer an incoming call from the AG (No in-band ringing) (Private Mode)".

if CLI is sent from network

if CLI is sent from network

if audio connection is not present

6.2.6.5 Answer an incoming call from the AG (In-band ringing) (Private Mode)
Attention:
This sequence may be selected by the AG. See “Answer an incoming call from the AG (In-band ringing) (Handsfree Mode)”.

if audio connection is not present

if CLI is sent from network

if CLI is sent from network

Attention:
This sequence may be selected by the AG. See “Answer an incoming call from the AG (In-band ringing) (Handsfree Mode)”. 
6.2.6.6 Answer an incoming call from the AG (In-band ringing) (Handsfree Mode)

Attention:
This sequence may be selected by the AG. See "Answer an incoming call from the AG (In-band ringing) (Private Mode)".

if audio connection is not present

if CLI is sent from network

if CLI is sent from network

Service Level Connection (HFP)

+CIEV : (callsetup = 1)

audio connection established

RING ALERT

+CLIP nnn

alert the incoming call

CLI nnn

in-band ring tone

start the call establishment procedure and the call established

voice communication

+CIEV : (call = 1)

+CLIP nnn

alert the incoming call

CLI nnn

in-band ring tone

in-band ring tone

repetition

Accept

RING ALERT

+CLIP nnn

call active

Cellular Network

Cellular Phone (AG)

AG HMI

HF

Car Equipment (HF)

HMI

Attention:
This sequence may be selected by the AG. See "Answer an incoming call from the AG (In-band ringing) (Private Mode)".

in-band ring tone
6.2.6.7 Reject an incoming call from the HF (No in-band ringing)

If CLI is sent from the network:

1. Alert the incoming call
2.Ring tone
3. Alert the incoming call
4. CLI nnn
5. Ring tone
6. Reject
7. AT+CHUP(REJECT)
8. OK
9. Call process terminated

If CLI is sent from the network:

1. Alert the incoming call
2. CLI nnn
3. Call rejection procedure
4. +CIEV : (callsetup = 0)
6.2.6.8 Reject an incoming call from the HF (In-band ringing)

- **Incoming call**

- **Cellular Network**
  - **Cellular Phone (AG)**
  - **Car Equipment (HF)**

- **Service Level Connection (HFP)**
  - **HMI**
  - **HF**

- **Audio connection setup (HFP4.11)**
  - **RING ALERT**
  - **CLI nnn**
  - **+CLIP nnn**

- **In-band ring tone**
  - **alert the incoming call**
  - **RING ALERT**
  - **CLI nnn**
  - **+CLIP nnn**

- **Audio connection released (HFP4.12)**
  - **AT+CHUP(REJECT)**
  - **OK**
  - **+CIEV : (callsetup = 0)**

- **Call process terminated**

- **Call rejection procedure**
6.2.6.9 Reject an incoming call from the AG (No in-band ringing)

If CLI is sent from network, alert the incoming call. Then, if CLI is sent from network, alert the incoming call again. If ring tone is played, reject the call. If call setup is equal to 1, +CIEV is sent. If call setup is equal to 0, +CIEV is sent. The call rejection procedure is terminated.
6.2.6.10 Reject an incoming call from the AG (In-band ringing)

- **Incoming call**
  - Cellular Network
  - Cellular Phone (AG) AG HMI
  - Car Equipment (HF) HMI HF

- **Audio Connection setup (HFP4.11)**
  - Audio Connection setup

- **in-band ring tone**
  - RING ALERT
  - +CLIP nnn

- **Audio Connection release (HFP4.12)**
  - audio connection released

- **call rejection procedure**
  - +CIEV : (callsetup = 0)
  - call process terminated

- **Service Level Connection (HFP)**
  - audio connection established

- **alert the incoming call**
  - CLI nnn
  - +CLIP nnn

- **if CLI is sent from network**
  - repetition

- **if audio connection is not present**
  - reject

- **in-band ring tone**

- **call process terminated**
  - +CIEV : (callsetup = 0)

- **Service Level Connection (HFP)**

- **audio connection released**

- **call rejection procedure**
6.2.6.11 Change the in-band ring tone setting

In the case of disabling the in-land ring tone on the AG:
- In the case of enabling the in-land ring tone on the AG:

   - Service Level Connection (HFP)
   - +BSIR : 0
   - set the AG's in-land ring tone function disable
   - internal event
   - +BSIR : 1
   - set the AG's in-land ring tone function enable
   - internal event
6.2.6.12 Incoming call (Canceling the call by the remote party)

- If audio connection is present,
- Audio connection released
- Call process terminated
- +CIEV : (callsetup = 0) call process terminated
- Audio connection release (HFP4.12)
- Incoming call
- Cancel the incoming call
- Service Level Connection (HFP)
- Incoming call procedure
- Cellular Network
- Cellular Phone (AG) AG HMI
- Car Equipment (HF) HMI HF
- Copyright 2006-2011 Mobile Computing Promotion Consortium (MCPC)
6.2.7 Terminate a call process
6.2.7.1 Terminate a call process from the HF

If there is an ongoing call by the HF, the process continues. If there is no call, the call release procedure is performed.

- AT+CIEV : (call = 0)
- Audio connection released
- audio connection release (HFP4.12)
- voice communication

If there is an ongoing call by the HF or the AG, the call release procedure is performed.

- AT+CHUP(END)
- OK
- voice communication

Audio connection release (HFP4.12)

Service Level Connection (HFP)

Audio Connection (HFP)
6.2.7.2 Terminate a call process from the AG

- **If there is an ongoing call by the HF:**
  - Audio Connection (HFP)
  - Service Level Connection (HFP)

- **If there is an ongoing call by the HF or the AG:**
  - Audio connection released
  - +CIEV : (call = 0)

- **No call:**

- **Termination:**
  - Call release procedure
  - Audio connection released
  - Voice communication
6.2.7.3 Terminate a call process from the cellular network

If the AG enables to transfer busy tone over audio connection

If user terminates from the HF

If user terminates from the AG

If user doesn't terminate

Audio Connection (HFP)

Service Level Connection (HFP)

Voice communication

Audio connection released

+CIEV: (call = 0)

audio connection release (HFP4.12)

AT+CHUP(END)

OK

release the call

+CIEV: (call = 0)

if user terminates from the AG

Constant time \( T_{busy} \)

Audio connection released

+CIEV: (call = 0)

if user terminates from the HF

Terminate a call process from the cellular network

Car Equipment (HF)

Cellular Phone (AG)

Cellular Network

HMI HF

AG HMI

no call

busy tone

terminate

audio connection released

no call

+CIEV: (call = 0)

audio connection release (HFP4.12)

if user doesn't terminate

Audio connection released

no call

+CIEV: (call = 0)

audio connection release (HFP4.12)

if user terminates from the AG

Audio connection released

no call

+CIEV: (call = 0)

audio connection release (HFP4.12)

if user terminates from the HF

Audio connection released

no call

+CIEV: (call = 0)

audio connection release (HFP4.12)
6.2.7.4 Terminate a call process from the cellular network (communication by Private Mode)

- If user terminates from the HF:
  - Terminate
  - AT+CHUP(END)
  - OK
  - +CIEV : (call = 0)

- If user terminates from the AG:
  - Terminate
  - Constant time T_{busy}
  - +CIEV : (call = 0)

- If user doesn't terminate:
  - No call
  - +CIEV : (call = 0)
6.2.8 Connection release
6.2.8.1 Connection release from the HF

- Car Equipment (HF)
  - HMI
  - HF

- Cellular Phone (AG)
  - AG
  - HMI

- Cellular Network

if audio connection is present

- audio connection released
  - audio connection release (HFP4.12)
  - service level connection release (HFP4.3)

release B.T

B.T.release completed

audio connection released

audio connection released

B.T.release completed

Service Level Connection (HFP)
### 6.2.8.2 Connection release from the AG

**Car Equipment (HF)**
- **HMI**
- **HF**

**Cellular Phone (AG)**
- **AG**
- **HMI**

**Cellular Network**

- **Service Level Connection (HFP)**
- **audio connection release (HFP4.12)**
- **audio connection released**
- **B.T.release completed**
- **release B.T**
- **service level connection release (HFP4.3)**
- **B.T.release completed**

If audio connection is present,
### 6.2.9 Three way calling

#### 6.2.9.1 Setting the three way calling

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
<td>HMI</td>
</tr>
</tbody>
</table>

- **Service Level Connection (HFP)**

*Activate the three way calling*

- AT+CCWA=1
- OK

*Deactivate the three way calling*

- AT+CCWA=0
- OK
6.2.9.2 Three way calls – Third party call placed from the HF

- Dialing or memory dialing
- ATD….
- OK
- +CIEV : (callsetup = 2)
- +CIEV : (callheld = 2)
- Hold the call X and start the call Y establishment procedure
- Busy tone / ring back tone
- +CIEV : (callsetup = 3)
- +CIEV : (callsetup = 0)
- +CIEV : (callheld = 1)
- Second call established
- Voice communication X
- Voice communication Y
- +CIEV : (callheld = 2)
- Second call established

Depends on the cellular network, Busy tone or Ring Back Tone will be played

"+CIEV:(callheld=2)" may be transmitted due to the AG implementation.
6.2.9.3 Three way calls – Third party call placed from the AG

- Service Level Connection (HFP)
- Audio Connection (HFP)

voice communication X

dialing or memory dialing

+CIEV : (callsetup = 2)

hold the call X and start the call Y establishment procedure

+CIEV : (callheld = 2)

second call established

held call X

voice communication Y

busy tone / ring back tone

+CIEV : (callsetup = 3)

+CIEV : (callsetup = 0)

+CIEV : (callheld = 1)

+CIEV : (callheld = 2)

"+CIEV:(callheld=2)” may be transmitted due to the AG implementation.

Depends on the cellular network, Busy tone or Ring Back Tone will be played.
6.2.9.4 Three way calling from the HF (SEND 0)

In the case that another call is waiting

In the case that another call is being held

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6.2.9.5 Three way calling from the AG (SEND 0)

When another call is waiting

- +CCWA:nnn
  - Reject the waiting call

When another call is being held

- +CIEV: (callsetup = 1)
  - Busy tone to the waiting call

- +CIEV: (callhold = 0)
  - Release the held call

Voice communication X

In the case that another call is waiting

- +CCWA:nnn
  - May be repeated due to the AG implementation.

In the case that another call is being held

- +CIEV: (callhold = 0)
  - Release call Y

Voice communication X

Service Level Connection (HFP)

Audio Connection (HFP)

Cellular Network

Cellular Phone (AG)

AG HMI

Car Equipment (HF)

HMI HF

Voice communication X

Waiting call Y

Busy tone to the waiting call Y

Release call Y

Handset Profile 1.5 Guideline

Version 1.5

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6.2.9.6 Three way calling from the HF (SEND 1)

In the case that another call is waiting

Voice communication Y

AT+CHLD=1

OK

+CCWA:nnn

+CIEV: (call = 0)

+CIEV: (call = 1)

+CIEV: (call = 2)

In the case that another call is being held

Voice communication Y

AT+CHLD=1

OK

+CCWA:nnn

+CIEV: (call= 1)

+CIEV: (call= 2)

“+CCWA:nnn” and “+CLIP:nnn” may be repeated due to the AG implementation.

These indicators may be transmitted due to the AG implementation.

This indicator may be transmitted due to the AG implementation.

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6.2.9.7 Three way calling from the AG (SEND 1)

In the case that another call is waiting

the waiting call Y of CLI nnn

+CCWA:nnn

+CIEV: (call = 0)
+CIEV: (call = 1)

In the case that another call is being held

release audio connection

release audio connection

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

voice communication X

voice communication Y

voice communication X

voice communication Y

release audio connection

release audio connection

release call X

release call X

switch to call Y and disconnect call X

switch to call Y and disconnect call X

held call Y

held call Y

These indicators may be transmitted due to the AG implementation.

These indicators may be transmitted due to the AG implementation.

"+CCWA:nnn" and "+CLIP:nnn" may be repeated due to the AG implementation.

These indicators may be transmitted due to the AG implementation.

These indicators may be transmitted due to the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.

Communication on the HF or the AG depends on the AG implementation.

Voice communication X

Voice communication Y

Voice communication X

Voice communication Y

Communication on the HF or the AG depends on the AG implementation.
6.2.9.8 Three way calling from the HF (SEND 1<idx>) – Release Specified Call index

```
AT+CLCC
+CLCC:(idx=2,dir=0,status=1,
mode=0,mprty=1
[,<number>,<type>])
OK
```

The AG reports the list of current calls.

```
AT+CHLD=11
OK
```

release call X

voice communication Y

In the case that call X is specified.

check an index of calls

disconnect a specified call

AT+CLCC

+CLCC:(idx=1,dir=0,status=1,
mode=0,mprty=1
[,<number>,<type>])

OK

voice communication X+Y

Service Level Connection (HFP)

Audio Connection (HFP)

Cellular Network

Car Equipment (HF)

HMI

HF

Cellular Phone (AG)

AG

HMI

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6.2.9.9 Three way calling from the AG (SEND 1<idx>) – Release Specified Call index

- Service Level Connection (HFP)
- Audio Connection (HFP)

In the case that call X is specified.

Voice communication X+Y

Check an index of calls

Disconnect a specified call

Release call X

Voice communication Y
6.2.9.10 Three way calling from the HF (SEND 2)

```
Cellular Network

+CCWA:nnn

waiting call Y

+CIEV : (callsetup = 1)

+CCWA:nnn

hold call X and switch to call Y

AT+CHLD=2

OK

+CIEV : (callsetup = 0)

+CIEV : (callheld = 2)

+CIEV : (callheld = 1)

voice communication X

+CCWA:nnn

hold call Y of CLI nnn

voice communication Y

hold call Y and switch to call X

AT+CHLD=2

OK

+CIEV : (callheld = 2)

+CIEV : (callheld = 1)

voice communication X

This indicator may be transmitted due to the AG implementation.
```

“+CCWA:nnn” and “+CLIP:nnn” may be repeated due to the AG implementation.
6.2.9.11 Three way calling from the AG (SEND 2)

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
<td>HMI</td>
</tr>
</tbody>
</table>

- **Service Level Connection (HFP)**
- **Audio Connection (HFP)**

- +CCWA:nnn
- +CIEV: (callsetup = 1)
- +CIEV: (callsetup = 0)
- +CIEV: (callheld = 2)
- +CIEV: (callheld = 1)

**Voice Communication X**

- waiting call Y
- +CCWA:nnn
- hold call X and switch to call Y

**Voice Communication Y**

- hold call Y and switch to call X
- +CIEV: (callheld = 2)
- +CIEV: (callheld = 1)

**Voice Communication X**

- hold call Y
- +CIEV: (callheld = 2)
- +CIEV: (callheld = 1)

This indicator may be transmitted due to the AG implementation.

"+CCWA:nnn" and "+CLIP:nnn" may be repeated due to the AG implementation.
6.2.9.12 Three way calling from the HF (SEND 2<idx>) – Private Consultation Mode

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
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<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
<td></td>
</tr>
<tr>
<td>HF</td>
<td>HMI</td>
<td></td>
</tr>
</tbody>
</table>

**Service Level Connection (HFP)**

**Audio Connection (HFP)**

- **voice communication X+Y**

- **check an index of calls**

  - **AT+CLCC**
    - 
      +CLCC:(idx=1,dir=0,status=1,mode=0,mprty=1[,<number>,<type>])
    - +CLCC:(idx=2,dir=0,status=1,mode=0,mprty=1[,<number>,<type>])

- **OK**

- **hold calls except the specified call**

  - **AT+CHLD=21**
  - **OK**

- **The AG reports the list of current calls**

  - **+CIEV : (callheld = 1)**

- **In the case that call X is specified.**

  - **voice communication X+Y**
  - **held call Y**
6.2.9.13 Three way calling from the AG (SEND 2<idx>) – Private Consultation Mode

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
<td></td>
</tr>
<tr>
<td>HF</td>
<td>HMI</td>
<td></td>
</tr>
</tbody>
</table>

- **Service Level Connection (HFP)**
- **Audio Connection (HFP)**

Voice communication X+Y

Check an index of calls

Hold calls except the specified call

In the case that call X is specified.

+CIEV : (callheld = 1)

Hold call Y

Voice communication X

Hold call Y
6.2.9.14 Three way calling form the HF (SEND 3)

AT+CHLD=3
OK
+CIEV : (callheld = 0)

Service Level Connection (HFP)
Audio Connection (HFP)

voice communication X+Y

Cellular Network
Car Equipment (HF)
Cellular Phone (AG)

HMI HF AG HMI

held call X

switch to three way calling

voice communication Y
6.2.9.15 Three way calling from the AG (SEND 3)

- Car Equipment (HF)
  - HMI
  - HF

- Cellular Phone (AG)
  - AG
  - HMI

- Cellular Network

Service Level Connection (HFP)
Audio Connection (HFP)

- held call X
- voice communication Y
- switch to three way calling
+CIEV : (callheld = 0)

voice communication X+Y
6.2.9.16 Three way calling from the HF (SEND 4)

Connect the two calls and disconnect own call from the line.

AT+CHLD=4

OK

Audio connection released

no call

+CIEV : (call = 0)

Audio connection released (HFP 4.12)

voice communication X+Y

Cellular Network

Cellular Phone (AG)

AG HMI

Car Equipment (HF)

HMI HF

Service Level Connection (HFP)

Audio Connection (HFP)
6.2.9.17 Three way calling from the AG (SEND 4)

- Car Equipment (HF)
  - HMI
  - HF

- Cellular Phone (AG)
  - AG
  - HMI

- Cellular Network

Voice communication X+Y

Audio connection released

audio connection release (HFP4.12)

 connect the two calls and disconnect own call from the

call release procedure

voice communication between X and Y

+CIEV : (call = 0)
6.2.10 Audio connection transfer

6.2.10.1 Audio connection transfer towards the HF (Operated by the HF)

- If audio connection is already present, this path will be used for Audio connection transfer.
- If audio connection is not present, audio connection setup (HFP4.11) is established.

Service Level Connection (HFP)

Audio Connection (HFP)

Cellular Network

Cellular Phone (AG)

AG HMI

Car Equipment (HF)

HMI HF

Voice communication

Transfer the ongoing call to the HF

Audio connection established
6.2.10.2 Audio connection transfer towards the HF (Operated by the AG)

- If audio connection is already present, this path will be used for Audio connection transfer.
- If audio connection is not present, audio connection setup (HFP4.11) will be established.
- Service Level Connection (HFP) will be established between Car Equipment (HF) and Cellular Network.
- Audio Connection (HFP) will be established between Cellular Phone (AG) and Car Equipment (HF).
- Voice communication will be transferred to the HF.

Audio connection setup (HFP4.11) will be established if audio connection is not present.
6.2.10.3 Audio connection transfer towards the AG (Operated by the HF)

- **Car Equipment (HF)**
  - HMI
  - HF

- **Cellular Phone (AG)**
  - AG
  - HMI

- **Cellular Network**

**Voice Communication**

- **Transfer the ongoing call to the AG**
- **Audio Connection (HFP)**
- **Service Level Connection (HFP)**
- **Audio Connection Release (HFP4.12)**
- **Audio Connection Released**
6.2.10.4 Audio connection transfer towards the AG (Operated by the AG)

- Car Equipment (HF)
  - HMI
  - HF

- Cellular Phone (AG)
  - AG
  - HMI

- Cellular Network

- Service Level Connection (HFP)
- Audio Connection (HFP)

Voice communication

Audio connection released

Transfer the ongoing call to the AG

Audio connection released

Voice communication
6.2.11 Remote audio volume control

6.2.11.1 Remote audio volume control

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
<td></td>
</tr>
<tr>
<td>HF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Service Level Connection (HFP)

- +VGM:Nmic
  - change the HF microphone gain to Nmic
- +VGS:Nspeak
  - change the HF speaker gain to Nspeak

- set the HF microphone gain to Nmic
- set the HF speakers gain to Nspeak
6.2.11.2 Volume level synchronization

AT+VGM=Nmic
change the HF microphone gain to Nmic

AT+VGS=Npeak
change the HF speaker gain to Npeak

OK

OK
6.2.12 Response and Hold
6.2.12.1 Query response and hold status of the AG

AT+BTRH?
+BTRH:0
query the current Response and Hold status

held call present

Service Level Connection (HFP)

If the AG is not in the Response and Hold state, then no response shall be sent.

holding the call

OK
6.2.12.2 Put an incoming call on hold from the HF (No in-band ringing)

- If CLI is sent from network:
  - CLI nnn
  - Alert the incoming call
  - RING ALERT
  - +CLIP nnn

- Ring tone

- Put on hold
  - AT+BTRH=0
  - +BTRH=0
  - OK

- Complete on hold

- Holding tone
  - +CIEV : (call = 1)
  - +CIEV : (callsetup = 0)

- Call active

- Puts the incoming call on Hold

- Holding the call
6.2.12.3 Put an incoming call on hold from the HF (In-band ringing)

If audio connection is not present.

If CLI is sent from network.

If CLI is sent from network.

If audio connection is not present.

Audio Connection setup (HFP4.11)

RING ALERT

+CLIP nnn

in-band ring tone

alert the incoming call

CLI nnn

repetition

in-band ring tone

RING ALERT

+CLIP nnn

alert the incoming call

CLI nnn

Put on hold

AT+BTRH=0

+BTRH:0

Complete on hold

OK

holding tone

+CIEV : (call = 1)

+CIEV : (callsetup = 0)

call active

Puts the incoming call on Hold

holding the call

incoming call

audio connection established

audio connection established

Service Level Connection (HFP)

Car Equipment (HF)

Cellular Phone (AG)

Cellular Network

HMI HF

AG HMI

+CIEV : (callsetup = 1)
6.2.12.4 Put an incoming call on hold from the AG (No in-band ringing)

If CLI is sent from network:

- Alert the incoming call
- Ring tone
- CLI nnn

If CLI is sent from network:

- Alert the incoming call
- Ring tone
- CLI nnn

Service Level Connection (HFP)

- Alert the incoming call
- Ring tone
- CLI nnn

Complete on hold

- Holding tone
- +CIEV : (call = 1)
- +CIEV : (callsetup = 0)

Put on hold

- +BTRH:0

Putting the incoming call on hold

Cellular Network

Car Equipment (HF)
HMI HF

Cellular Phone (AG)
AG HMI

Incoming call

Repetition
6.2.12.5 Put an incoming call on hold from the AG (In-band ringing)

If audio connection is not present:
- Audio connection established
- Alert the incoming call
- in-band ring tone
- audio connection released
- Audio Connection release (HFP4.12)
- Complete on hold
- call active

If CLI is sent from network:
- +CLI nnn
- +CLIP nnn
- RING ALERT
- +CIEV : (callsetup = 1)
- Audio Connection setup (HFP4.11)
- Alert the incoming call
- in-band ring tone
- audio connection established
- +BTRH:0
- Puts the incoming call on Hold
- holding tone
- holding the call

If CLI is sent from network:
- +CLI nnn
- +CLIP nnn
- RING ALERT
- +CIEV : (call = 1)
- audio connection established
- Alert the incoming call
- in-band ring tone
- audio connection established
- +BTRH:0
- Puts the incoming call on Hold
- holding tone
- holding the call
6.2.12.6 Accept a held incoming call from the HF (No SCO link)

- Holding tone sounds from either the HF or the AG
- Complete acceptance
- If audio connection is not present.

Voice Communication

Service Level Connection (HFP)

Audio Connection setup (HFP4.11)

Accept a held incoming call from the HF (No SCO link)

Cellular Network

Car Equipment (HF)

HMI

HF

Cellular Phone (AG)

AG

HMI

Audio connection established

If audio connection is not present.

If audio connection is not present.

Accept the held call

AT+BTRH=1

+BTRH:1

OK

Accept the held incoming call

holding tone

holding tone

holding the call

holding tone

holding the call

if audio connection is not present.
6.2.12.7 Accept a held incoming call from the HF (SCO link)

- Cellular Network
- Car Equipment (HF)
- Cellular Phone (AG)

Service Level Connection (HFP)

Audio Connection (HFP)

holding tone

accept the held call

AT+BTRH=1

+BTRH:1

OK

Complete acceptance

voice communication

holding the call

accept the held incoming call
6.2.12.8 Accept a held incoming call from the AG (No SCO link)

- Car Equipment (HF)
  - HMI
  - HF

- Cellular Phone (AG)
  - AG
  - HMI

- Cellular Network

Holding tone sounds from either the HF or the AG

Service Level Connection (HFP)

holding tone

holding tone

holding the call

accept the called party

accept the held call

Accept a held incoming call from the AG (No SCO link)

Complete acceptance

+BTRH:1

voice communication
6.2.12.9 Accept a held incoming call from the AG (SCO link)

- Car Equipment (HF)
  - HMI
  - HF

- Cellular Phone (AG)
  - AG
  - HMI

- Cellular Network

Service Level Connection (HFP)

Audio Connection (HFP)

holding tone

audio connection released

Complete acceptance

+BTRH:1

holding the call

accept the held call

Audio Connection release (HFPv1.2)

Audio connection released

voice communication

accept the held incoming call

Complete acceptance
6.2.12.10 Reject a held incoming call from the HF (No SCO link)

- Holding tone sounds from either the HF or the AG
- Service Level Connection (HFP)
- Holding tone
- reject the held call
- AT+BTRH=2
- +BTRH:2
- OK
- +CIEV : (call =0)
- no call
- Cellular Network
- Holding tone
- holding tone
- holding the call
- reject the held incoming call

Service Level Connection (HFP)

Car Equipment (HF)
HMI HF

Cellular Phone (AG)
AG HMI

Cellular Network
6.2.12.11 Reject a held incoming call from the HF (SCO link)

```
+CIEV : (call =0)
AT+BTRH=2
+BTRH:2
OK
Audio Connection release (HFP4.12)
holding tone
reject the held call
reject the held incoming call
+CIIV : (call =0)
audio connection released
audio connection released
holding the call
holding the call
no call
```

Car Equipment (HF)    Cellular Phone (AG)    Cellular Network
HMI  HF               AG  HMI
Service Level Connection (HFP)
Audio Connection (HFP)
6.2.12.12 Reject a held incoming call from the AG (No SCO link)

- Holding tone sounds from either the HF or the AG
- Service Level Connection (HFP)
  - holding tone
  - reject the held call
  - +BTRH:2
  - +CIEV: (call =0)
- Cellular Network
  - holding the call
  - reject the held incoming call

Cellular Network

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
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<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>HF</td>
<td></td>
</tr>
<tr>
<td>AG</td>
<td>HMI</td>
<td></td>
</tr>
</tbody>
</table>

No call
6.2.12.13 Reject a held incoming call from the AG (SCO link)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
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<td>HF</td>
<td>AG</td>
</tr>
</tbody>
</table>

- **Service Level Connection (HFP)**
- **Audio Connection (HFP)**

- **holding tone**
- **reject the held incoming call**
- **reject the held call**
- **audio connection released**
- **+CIEV: (call =0)**
- **+BTRH:2**
- **holding the call**
- **no call**
6.2.12.14 Terminate a held incoming call from the HF (No SCO link)

Holding tone sounds from either the HF or the AG

Service Level Connection (HFP)

Holding tone

terminate the held call

AT+CHUP

OK

+CIEV : (call =0)

no call

terminate the held incoming call
6.2.12.15 Terminate a held incoming call from the HF (SCO link)

- Terminate the held incoming call
- Audio connection release (HFP4.12)

+CIEV : (call =0)

AT+CHUP

Audio connection released

+CIEV : (call =0)

OK

Audio connection released

Holding tone

Terminating the held call

Cellular Network

Cellular Phone (AG)

AG | HMI

Car Equipment (HF)

HMI | HF

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6.2.12.16 Held incoming call terminated by the caller (No SCO link)

Held incoming call terminated by the caller (No SCO link)

Holding tone sounds from either the HF or the AG

Service Level Connection (HFP)

holding tone

holding tone

holding the call

terminated the held call

no call

+CIEV : (call =0)

+BTRH:2
6.2.12.17 Held incoming call terminated by the caller (SCO link)

- Car Equipment (HF)
  - HMI
  - HF

- Cellular Phone (AG)
  - AG
  - HMI

- Cellular Network

- Service Level Connection (HFP)
- Audio Connection (HFP)

- holding tone

- audio connection released
- audio connection released
- +CIEV: (call =0)

- +BTRH:2

- the held call terminated by Caller
- holding the call

- no call
6.2.13 Others
6.2.13.1 Transmitting DTMF codes

- AT+VTS=1
- enter Key 1
- send DTMF code of Key 1
- OK
- Voice Communication (HFP)
- Service Level Connection (HFP)
- Audio Connection (HFP)

Cellular Network

<table>
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<td>HMI</td>
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</tbody>
</table>

HF

AG

HMI
6.2.13.2 Calling line identification (CLI) notification

```
<table>
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<tr>
<td>HF</td>
<td>HMI</td>
<td></td>
</tr>
</tbody>
</table>
```

- **Service Level Connection (HFP)**
- **AT+CLIP=1**
- **OK**
- **enable the CLI notification**
6.2.13.3 Turning off the AG’s EC and NR

![Diagram of car equipment, cellular phone, and cellular network showing the process of turning off the AG’s EC and NR with AT+NREC=0 and OK messages.]

AO

OK

Service Level Connection (HFP)
6.2.13.4 Audio connection setup from the HF

Car Equipment (HF)

Service Level Connection (HFP)

establish the audio connection to AG

if audio connection is not present

audio connection established

Cellular Phone (AG)

voice communication

Cellular Network

audio connection setup (HFP4.11)

audio connection established
6.2.13.5 Audio connection setup from the AG

Audio connection setup from the AG Car Equipment (HF) Cellular Phone (AG) Cellular Network

HMI HF AG HMI

Service Level Connection (HFP)

establish the audio connection to HF

audio connection setup (HFP4.1.1)

audio connection established

voice communication

if audio connection is not present

audio connection established
6.2.13.6 Voice recognition activation – AG initiated

- Service Level Connection (HFP)
- +BVRA=1
- audio connection established
- start the voice recognition
- voice
- voice recognition
- if audio connection is not present
- audio connection setup (HFP4.11)
- activate the voice recognition
6.2.13.7 Voice recognition activation (Deactivated by the AG)

- **Car Equipment (HF)**
  - HMI
  - HF

- **Cellular Phone (AG)**
  - AG
  - HMI

- **Cellular Network**

  - **Service Level Connection (HFP)**
    - activate the voice recognition
    - AT+BVRA=1
    - OK
    - audio connection setup (HFP4.11)
    - audio connection established
    - start the voice recognition
    - voice recognition end
    - audio connection release (HFP4.12)
    - audio connection released
    - stop the voice recognition
    - if audio connection is not present
      - audio connection established
      - if audio connection is not present

- **Voice**
  - voice recognition
  - +BVRA: 0

- **if audio connection is not present**
  - audio connection released
6.2.13.8 Voice recognition activation (Deactivated by the HF)

- **Activate the voice recognition**
  - AT+BVRA=1
  - OK
  - Audio connection setup (HFP4.11)

- **Start the voice recognition**

- **Deactivate the voice recognition**
  - AT+BVRA=0
  - OK

- **Voice recognition end**

- **Audio connection release (HFP4.12)**

- **Audio connection released**

- **Service Level Connection (HFP)**

- **Audio connection established**

- **If audio connection is not present**

- **Audio connection released**

- **Cellular Network**
### 6.2.13.9 Attaching a phone number to a voice tag

1. **Service Level Connection (HFP)**
   - get the phone number
   - AT+BINP=1
   - choose or enter the phone number nnn
   - +BINP:<phone number>
   - OK

2. Attach the phone number nnn to the voice tag.
6.2.13.10 Extended AG Error Results Code

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
<td></td>
</tr>
<tr>
<td>HF</td>
<td>HMI</td>
<td></td>
</tr>
</tbody>
</table>

Service Level Connection (HFP)

+CME ERROR shall not be used

AT+CMEE=0

OK

AT+CGMI

ERROR

+CME ERROR use numeric <err>

AT+CMEE=1

OK

AT+CGMI

+CME ERROR: 1
6.2.13.11 Outgoing call (no network)

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
<th>Cellular Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
<td>AG</td>
</tr>
<tr>
<td>HF</td>
<td>HMI</td>
<td>HMI</td>
</tr>
</tbody>
</table>

- **Outgoing call failure**: If AT+CMEE=1 has not been received.
- **+CME ERROR :30**: If AT+CMEE=1 has been received.
- **ERROR**: If AT+CMEE=1 has not been received.
- **Service Level Connection (HFP)**
- **number dialing**: ATDdddd...;
- **Request dialing**: If no network service

Outgoing call failure
6.2.13.12 Subscriber Number Information

If the subscriber number information is not available, the AG shall send no +CNUM response.
If multiple numbers are available, the AG shall send a separate +CNUM for each available number.
6.3 Abnormal Usage Scenarios

6.3.1 Service level connection loss during an ongoing call (the reconnection fails)

- **Car Equipment (HF)**
  - HMI
  - HF

- **Cellular Phone (AG)**
  - AG
  - HMI

- **Cellular Network**

VoIP communication

---

**Service Level Connection (HFP)**

**Audio Connection (HFP)**

---

**voice communication**

---

**SuperVisionTimeout**

**service level connection loss**

**repeat set up until time out**

**constant time Twaitslc**

**time out**

**no call**

---

**call release procedure**

**no call**

---

**keeping the call**

---

**Case 1:**
Release the call after expire of SuperVisionTimeout

---

**Case 2:**
Release the call after expire of SuperVisionTimeout with the AG’s another parameter

---

**Case 3:**
Keep the call even if SLC is disconnected
6.3.2 Outgoing call (Canceling the call process due to no service for the AG)

- **Service Level Connection (HFP)**
- **Cellular Network**
- **Car Equipment (HF)**
  - HMI
  - HF
- **Cellular Phone (AG)**
  - AG
  - HMI

**Outgoing call procedure**

1. **Detect no service**
2. **+CIEV : (service = 0)**
3. **Cancel the call establishment procedure**

**If the AG enables to transfer busy tone over audio connection**

- **Busy tone**
- **If user terminates from the HF**
- **If audio connection is present**

- **Audio connection released**
- **AT+CHUP(END)**
- **OK**
- **+CIEV : (callsetup = 0)**

**If the AG is not available due to no service**

- **Audio connection released**
- **No call**
- **Dialing**
- **Outgoing call procedure**
- **No call**
- **Detect no service**
- **+CIEV : (service = 0)**
- **Cancel the call establishment procedure**
if user terminates from the AG

if audio connection is present

if user doesn't terminate

if audio connection is present

audio connection released

no call

constant time $T_{busy}$

audio connection released

$\texttt{+CIEV : (callsetup = 0)}$

terminate

audio connection released

audio connection released

$\texttt{+CIEV : (callsetup = 0)}$

no call

if audio connection is present

if audio connection is present

no call

audio connection released

audio connection released

$\texttt{+CIEV : (callsetup = 0)}$
6.3.3 Terminate a call process due to no service for the AG

If the AG enables to transfer busy tone over audio connection:
- If user terminates from the HF, terminate audio connection
- If audio connection is present:
  - No call
  - audio connection released
  - AT+CHUP(END)
  - OK

Detect no service:
- +CIEV : (service = 0)
- No service

If AG is not available due to no service:
- Release the call

Audio connection release (HFP4.12)
- +CIEV : (call = 0)
- Audio connection released

Service Level Connection (HFP)
- Voice communication

Audio Connection (HFP)
- Cellular Network
- Cellular Phone (AG)
- Car Equipment (HF)
- HMI

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If user terminates from the AG:

If audio connection is present:
- Audio connection released
- No call

If user doesn't terminate:
- Audio connection released
- +CIEV: (call = 0)

If audio connection is present:
- Audio connection released
- +CIEV: (call = 0)

Constant time $T_{bus}$

Audio connection released (HFP4.12)

Audio connection released

Audio connection released

No call

Audio connection released (HFP4.12)

Audio connection released

Audio connection released

Audio connection released

Terminate
6.3.4 Incoming call (Canceling the call process due to no service for the AG)

IF audio connection is present

audio connection released

+CIEV : (calsetup = 0)

cancel the call procedure

no service

detect no service

+CIEV : (service = 0)

no service

incoming call

incoming call procedure

AG is not available due to no service

HMI HF

Cellular Phone (AG)

AG HMI

Cellular Network

Service Level Connection (HFP)

if audio connection is present

audio connection released

+CIEV : (calsetup = 0)

cancel the call procedure

no service

detect no service

+CIEV : (service = 0)

no service

incoming call

incoming call procedure

AG is not available due to no service

HMI HF

Cellular Phone (AG)

AG HMI

Cellular Network

Service Level Connection (HFP)
6.3.5 Service level connection loss during audio connection (the reconnection fails)

- Car Equipment (HF)
  - HMI
  - HF
- Cellular Phone (AG)
  - AG
  - HMI
- Cellular Network

Service Level Connection (HFP)

Audio Connection (HFP)

voice communication

Service level connection loss

SuperVisionTimeout

constant time Twaitslc

Repeat set up until time out

service level connection setup (HFP 4.2)

Time out

SuperVisionTimeout

service level connection loss

service level connection loss

service level connection loss
6.3.6 Service level connection loss during service level connection (the reconnection fails)
6.3.7 Service level connection loss and reconnection succeeded

- Service level connection setup (HFP4.2)
  - same as the procedure of "Service Level Connection setup"

Service Level Connection (HFP)

Connection loss and reconnection succeeded
6.3.8 Service level connection loss during the procedure (the reconnection fails)

Cellular Network

<table>
<thead>
<tr>
<th>Car Equipment (HF)</th>
<th>Cellular Phone (AG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMI</td>
<td>AG</td>
</tr>
<tr>
<td>HF</td>
<td>HMI</td>
</tr>
</tbody>
</table>

- Service Level Connection (HFP)
- procedure

- service level connection loss
- cancel the procedure

SuperVisionTimeout

Repeat setup until time out

constant time

Twaitslc

constant time

Twaitslc

service level connection setup (HFP4.2)

Time out

Time out
MCPC-TR-002

Hands-Free Profile 1.5

Application Guideline

Appendix A

Version 1.51

Oct/19/2011

Mobile Computing Promotion Consortium

Technical Committee
Appendix A Contents
(Phonebook Transfer Guideline)

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1. Abstract

This document describes the guideline how to transfer the phonebook from the cellular phone or the PDA to the Hands-Free Car Kit using Bluetooth wireless technology. Generally, we already have some of the solutions to support phonebook transfer as follows.

(1) vCard with OBEX
(2) AT command
(3) Custom application for exchanging phonebook data

In this document, we select and show the guideline of (1). Because vCard and OBEX is already standardized as OPP (Object Push Profile) in the Bluetooth SIG, it can be utilized for the multipurpose. This technology can resolve the problem of sorting or selecting Japanese character data (ex. Furi-gana, which means sound).
### 2. Phonebook transfer features of the cellular phone

Regarding the phonebook transfer of the cellular phone, the following features shall be supported as the OBEX Client/Server operations. This table shows which feature shall be Mandatory(M), Option(O), Not-Recommended(N/R) or Not-Applied(N/A). If the cellular phone does not have phonebook storing ability, its supported feature is N/A.

“OBEX Authentication” in the table below is a kind of certifying operation in order to identify whether the remote device is the correct target requested to connect when OBEX is initiated. The details of OBEX Authentication are described in the next section.

<table>
<thead>
<tr>
<th>IrMC Level</th>
<th>OBEX Authentication (Note-1)</th>
<th>OBEX Client Support</th>
<th>OBEX Server Support</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Support</td>
<td>Operation</td>
<td></td>
</tr>
<tr>
<td><strong>Level 1 (Note-1)</strong></td>
<td>OBEX PUT object in Inbox</td>
<td>O</td>
<td>N/R</td>
</tr>
<tr>
<td><strong>Level 2</strong></td>
<td>OBEX PUT Entire Object Store</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td><strong>Level 2</strong></td>
<td>OBEX GET Entire Object Store</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>OBEX GET/PUT Objects by Static Indices</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td><strong>Level 4</strong></td>
<td>OBEX GET/PUT Objects by Unique Indices, Change Log Support, Change Counter Support</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

**Note-1** Regarding OBEX Authentication,
- Level 1: Object transfer with an indefinite device. OBEX Authentication is not recommended to operate in this case.
- Level 2/3: Object transfer between devices of same user. OBEX Authentication is recommended to operate in this case. (Refer to IrMC Errata 990714 No.5)
- Level 4 is based on the Synchronization Profile Specification of Bluetooth SIG. OBEX Authentication shall be operated.

**Note-2** When Synchronization is realized, the Server shall support OBEX Authentication. However, the Client features so that the cellular phone initiates OBEX Authentication might be Optional.

**Note-3** Since supporting the PUT Client features enables entire object transfer and providing both the PUT/GET Client features makes user operations complicated, OBEX Authentication is not recommended to support for Level 2.

**Note-4** Since providing the PUT/GET Client features with specified Static Index makes user operations complicated, OBEX Authentication is not recommended to support for Level 3.

**Note-5** When Level 1 is initiated, input value in the Name header of transfer objects shall avoid one which can be confused with Level 2 object name, such as “pb.vcf” etc.

### 3. OBEX Authentication

The cellular phone shall support OBEX Authentication. During OBEX session establishment, the cellular phone shall execute Authentication Sequence specified in the section 3.1 and use Authentication Key specified in the section 3.2.
### 6.4.1 Authentication Sequence

“Normal Authentication” allows IrMC Level 1/2/3 OBEX operations. This enables accessing data in “telecom/#####” except “/luid/#####”. “Normal Authentication” shall be used for Level 2/3 OBEX Authentication when the cellular phone is the Client.

When the PUT Client/Server transfers only one object, it is not needed to execute OBEX Authentication. However, when the remote device requests OBEX Authentication, the local device shall respond with “Normal Authentication”. An example of “Normal Authentication” (PUT operation) is shown below. The details shall be referred in IrOBEX version 1.2, IrDA Object Exchange Protocol version 1.2, Infrared Data Association.

Example. Normal Authentication (PUT operation)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th><img src="#" alt="Table" /></th>
</tr>
</thead>
</table>
| 1 | Client | 1<sup>st</sup> Connect Request  
w/ Authentication Challenge  
w/o Target header |
| 2 | Server | 1<sup>st</sup> Connect Response  
w/ Authentication Challenge |
| 3 | Client | 2<sup>nd</sup> Connect Request  
w/ Authentication Response |
| 4 | Server | 2<sup>nd</sup> Connect Response  
w/ Authentication Complete |
| 5 | Client | ![6.4.1.1.1.1 PUT Request w/ one object](#) |
| 6 | Server | ![6.4.1.1.3 PUT Response](#) |

“#####” represents any object name.
### 6.5 3.2 Authentication Key

Users can setup the following Authentication Key.

Session Key: 4 digits numeric key. The device of Server side requests the Session Key during “Normal Authentication”. The value of the Session Key shall be same between the Client and the Server. The Session Key is canceled during OBEX session release after end of object transfer.

Example. “Normal Authentication” sequence and the Session Key usage

- **Client**
  - User inputs: Session Key 1234

- **Server**
  - User inputs: Session Key 1234

**Normal Auth. Connect Request**

- **Auth. Challenge (α)**
  - Generate "α"
  - H (α: 1234) Refer to the Session Key of the Client side.

- **Auth. Response (βc)**
  - If βc=βs, then OK

**Authentication Complete**
7. 4. OPP : Object Push Profile

OPP is already defined by the Bluetooth SIG, which was released on 22 February 2001. Most of current Bluetooth embedded cellular phones have OPP available, CCAP would like to utilize this as the phonebook transfer.

The phonebook format is defined to adopt vCard ver2.1 when using the telephony application in this specification.

OPP defines the roles, the server and the client. CCAP strongly requests that the AG should be the client and the HF should be the server at the point of the phone functionality.

8. 5. vCard

As defined in OPP, the format of the phonebook should be followed ver.2.1 of vCard. However, especially considering in Japanese situation, the HF Car Kit has to handle some of the ver3.0 of vCard because the property of “Sort_String” is used for information of “Furi-gana” in vCard 3.0. The following requirements or attentions should be considered for implementation.

8.1 5.1 Property

Properties of vCard for a standard cellular phone, which shall be careful to be implemented, are listed below. Multiple phone numbers for a name entry of vCard can be stated. However, this guideline does not specify the number of phone numbers.

<table>
<thead>
<tr>
<th>Property</th>
<th>Name</th>
<th>Support</th>
<th>Note</th>
<th>Ref.: IrMC1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERSION</td>
<td>Version</td>
<td>M</td>
<td>VCard 2.1</td>
<td>M</td>
</tr>
<tr>
<td>N</td>
<td>Name</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>SOUND or Sort_String</td>
<td>Furi-gana</td>
<td>M</td>
<td>Use the extended parameter.</td>
<td>Note.1</td>
</tr>
<tr>
<td>TEL</td>
<td>Phone number</td>
<td>M</td>
<td>Allow multiple entries</td>
<td>M</td>
</tr>
<tr>
<td>EMAIL</td>
<td>Mail address</td>
<td>M</td>
<td>Allow multiple entries</td>
<td>O</td>
</tr>
<tr>
<td>X-CLASS</td>
<td>Secret property</td>
<td>M</td>
<td>Value: Public[default] / Private</td>
<td></td>
</tr>
<tr>
<td>X-GNO</td>
<td>Group No.</td>
<td>O</td>
<td>Default value is 0.</td>
<td>Note.2</td>
</tr>
<tr>
<td>X-GN</td>
<td>Group name</td>
<td>O</td>
<td>Multi-Group entry is not allowed.</td>
<td>Note.2</td>
</tr>
<tr>
<td>X-REDUCTION</td>
<td>Speed dialing</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADR</td>
<td>Address</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ORG</td>
<td>Company name</td>
<td>O</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note.1 Refer to “IrMC Errata 2000 07 18 (July 28th 2000).”
Note.2 It is recommended both “Group number” and “Group name” be supported when the Group setting is applied.

< Export >

(1) Character code settings: CHARSET, ENCODING
- CHARSET: Shift-JIS or UTF8
- ENCODING: none
(2) Version information: VERSION
  - vCard 2.1
(3) Name: N
  - When the delimiter between the first name and the last name is needed, ‘;’ shall be used. The first name shall be set in Field-2 and the last name in Field-1.
  When the delimiter is not needed, the first name and the last name shall be set in Field-1.
(4) Furi-gana: SOUND or Sort_String
  - The extended parameter shall be used to indicate which property of “Furi-gana” is.
  - Default parameter shall be X-IRMC-N.
    Extended parameter name of property adding X-IRMC-“Furi-gana”
    Field etc. Same field shall exist as described after X-IRMC-[Property].
    CHARSET, ENCODING CHARSET: Shift-JIS/UTF8, ENCODING: none
  - Using the extended parameter X-IRMC-N, this shall be “Furi-gana” of N and have five fields as same as N.
(5) Telephone number: TEL
  - Multiple TEL shall be able to be included in a vCard.
  - Type of TEL shall be supported at least 5, general, cellular, home, work and FAX.
  - Multiple TEL shall be able to be set for a type of TEL.
    Example of type of TEL and the parameter:
    General -> VOICE [default]
    Cellular -> CELL
    Home -> HOME;VOICE
    Work -> WORK;VOICE
    FAX -> FAX
(6) E-mail address: EMAIL
  - Multiple EMAIL shall be able to be included in a vCard.
  - Multiple EMAIL shall be able to be set for the same address type of e-mail.
  - The parameter shall be supported at least INTERNET [default].
(7) Secret property: X-CLASS
  - IrMC Level 1 send: Send the default value [PUBLIC].
  - IrMC Level 2,3,4 send: Send Secret Property as it is.
  - Secret Property: OFF Send as PUBLIC.
  - Secret Property: ON Send as PRIVATE.
(8) Group No. and Group name: X-GNO, X-GN
  - IrMC Level 1 send: Not sent (Group No. to Group name correspondence between the sender and the receiver might not be kept.)
    - IrMC Level 2,3,4 send: Send as the setting
    - When the Group No. is not set, default value 0 shall be sent.
    - When the Group name is not set, only the property shall be sent.
(9) Speed dial: X-REDUCTION
  - IrMC Level 1 send: Not sent
  - IrMC Level 2,3,4 send: Send as the setting
(10) Address: ADR
  - Each field of ADR is shown below:
    Field-1 Postal address (Not popular in Japan.)
    Field-2 Extension address (Room No. of apartment, dormitory etc.)
    Field-3 Street (House No., Block No. etc.)
    Field-4 Minor district (Town, City etc.)
    Field-5 Major district (State, Prefecture etc.)
    Field-6 Postal code
    Field-7 Country
- If the address cannot be classified, it shall be described in Field-2.

(11) Company name: ORG
- Company name shall be set in Field-1.
- Section name shall be set in Field-2

(12) Send property for each IrMC Level:
- Data transfer in IrMC Level 1
  The main case is expected between cellular phones of different users. In this case, properties for Group settings and speed dial settings shall not be transferred in order to avoid inconsistency of date between the sender and the receiver. Secret property shall be transferred as the default value, PUBLIC.
- Data transfer in IrMC Level 2/3/4
  - The main case is expected between cellular phones or PC of the same user. In this case, all properties implemented shall be transferred as their settings

(13) Entire objects:
- When creating entire objects, the owner information shall be added as the head data. If the owner information is missing, the head data shall be empty.
- As an example of creating entire objects for a cellular phone which does not support Static Index of IrMC Level 3, the method of sorting the second data and the following data in Gojyu-on, the Japanese syllabary, order is expected.

< Import >

(1) Character code settings: CHARSET, ENCODING
- Receiving objects, which CHARSET is SHIFT-JIS or UTF8, shall be enabled. If CHARSET is not defined, it shall be regarded as SHIFT-JIS.
- If ENCODING is QUOTED-PRINTABLE or BASE64, the object shall be able to be received. If ENCODING is not defined, the object shall be able to be received as no ENCODING.
- If CHARSET/ENCODING is defined other types, the object shall be able to be received according to the feature of the cellular phone.

(2) Version information: VERSION
- VERSION:2.1 indicated vCard shall be able to be received.
- If there is no VERSION property, it shall be received as VERSION:2.1.
- If VERSION:3.0 is indicated, vCard3.0, it shall be able to be received according to the feature of the cellular phone.

(3) Name: N
- Data in Field-1 of N shall be set as the last name, Field-2 as the first name.
- If N is not divided in Fields, whole data shall be set as the last name.
- If there is no N property, or if N is NULL and FN exists, data in FN shall be set as a name. In this case, whole data shall be set as the last name.

(4) Furi-gana: SOUND or Sort_String
- Data shall be set as Furi-gana which property is indicated in extended parameter after SOUND or Sort_String.
- It is recommended that data between '<' and '>' can be received.

(5) Telephone number: TEL
- Example of the parameter and type of TEL:
  VOICE -> General phone [default]
  CELL -> Cellular phone
  HOME;VOICE -> Home
  WORK;VOICE -> Work
  FAX -> FAX
- If the parameter is not supported, it shall be set as default value, VOICE.
- The parameter added PREF shall be set in the first entry.
- If the total number of TEL over the max entries, exceeded data shall be discarded.

(6) E-mail address: EMAIL
- Unsupported parameters shall be set as default value, INTERNET.
- If the total number of EMAIL over the max entries, exceeded data shall be discarded.

(7) Secret property: X-CLASS
- IrMC Level 1 receive:
  Set as default value, PUBLIC
- IrMC Level 2/3/4 receive:
  If PUBLIC is indicated, set Secret property OFF.
  If PRIVATE is indicated, set Secret property ON.
  If illegal value is received, set as default value, PUBLIC.

(8) Group No. and Group name: X-GNO, X-GN
- IrMC Level 1 receive:
  Set Group No. as default value 0.
  Group name shall be set that of Group No.0. If Group name of Group No.0 is missing, Group name shall not be set.
- IrMC Level 2/3/4 receive:
  Group No. and Group name shall be set as they are.
  If there is inconsistency between received Group No. and received Group name, latter received information shall be applied.
  If the object has only Group No., Group name corresponding to the Group No. shall be set automatically.

(9) Speed dial: X-REDUCTION
- IrMC Level 1 receive:
  Set no Speed dial information.
- IrMC Level 2/3/4 receive:
  Set Speed dial information as it is.
  If another Speed dial settings are already applied for the receiver, latter received information shall be used and former settings shall be discarded.

(10) Address: ADR
- If received ADR is divided in to some fields and Field-7 (Country) is Japan, Field-5 (Major district) shall be set as the head data and assembled in order of Field-4, 3, 2 and 1.

(11) Company name: ORG
- Set the value in Field-1 as Company name and the value in Field-2 Section name.

(12) Owner/Local information:
- If entire objects are received in IrMC Level 2, the head data shall be applied for the owner information. In this case, the subscriber number shall not be replaced.
  If the head data is empty, it shall be discarded. The owner information shall not be replaced with the empty object.
- If the owner information is received in IrMC Level 4 Sync, the subscriber number shall not be replaced.

(13) Entire objects:
- When entire objects are received, feature of data indicating in received order or Goju-you-on, the Japanese syllabary, order shall be equipped.
- If the total number of objects over the max entries, exceeded data shall be discarded.

(14) Common notice for each property
- Properties not implemented in the cellular phone shall be discarded.
- Parameters not implemented in the cellular phone shall be set as default value.
- Data which length over the entry limit, exceeded data shall be discarded.

8.2 5.2 Size of the vCard
However the limitation of vCard size is not defined, it should be taken into account for receive buffer size of the Car Kit. Especially the recent cellular phone can handle the photograph, it is
recommended the transmit data can be selected by the user’s operation.

8.3 5.3 other
For Japanese use, "MCPC GL-003 OBEX Implementation Guideline" should be referred.
9. 6. Transfer
CCAP recommends to support the following object transfer.

(1) One object transfer
The OPP client can select just one object to be transferred. The way to select the object is implementation dependant. The selection by the user’s operation would be preferable. The client may close OBEX session after the transfer.

(2) Plural objects transfer
The OPP client can select plural objects to be transferred. The way to select the objects is implementation dependant. The selection by the user’s operation would be preferable. In this function, the user’s explicit operation to close OBEX session might be required on the OPP client.

(3) Entire objects transfer
The OPP client can select whole phonebook in the client.
In the specification of IrMC, OBEX authentication shall be executed when entire data push. However, it’s defined in OPP that this is not executed. In this guideline, CCAP recommends that OBEX authentication be not executed because Bluetooth authentication is already done and we think much of the convenience for the user.

10. 7. Others
(1) Additional properties for Japanese market
The following properties would be considered because the conventional cellular phones already implement them.
- Memory number
- Group number
- Group name
- Secret code

They are defined in MCPC GL-003.
11.8. Sequence chart (example)